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Experiments on Contagious Abortion

Immunisation Studies with Vaccines of Graded Virulence*

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In a previous paper (McEwen and Roberts, 1936) it was shown that the resistance of guinea-pigs to *Br. abortus* infection could be increased by vaccination with a living non-virulent culture of *Br. abortus*, strain 45. Furthermore, it was indicated that when the strain was passaged through a series of guinea-pigs its immunising properties might be enhanced.

The present paper is concerned with further comparative tests which have been made on groups of guinea-pigs, some vaccinated with the original strain 45 and others with variants from this strain obtained by passage through guinea-pigs in the manner described in the previous paper. As the serial passage of strain 45 proceeded so it gradually gained in virulence until it was as pathogenic for the guinea-pig as were freshly isolated field strains. Immunisation experiments have, however, been confined to variants of definitely reduced virulence. Further particulars of the virulence of these variants will be given in a subsequent paper; at present it is sufficient to say that the original strain could not be recovered from the spleens of guinea-pigs inoculated with 60,000 × 10^6 viable organisms from a 48-hour liver agar culture three or more weeks after inoculation, but that after the inoculation of similar quantities of the passaged variants a number of the animals were found with infected spleens several weeks after inoculation and that the ability of the variants to persist in the spleens of inoculated guinea-pigs increased as serial passage proceeded. The 6th, 13th, 18th and 20th passage variants have been used in these vaccination experiments; none of the variants caused macroscopic lesions in vaccinated guinea-pigs.

The original strain and the 6th and 13th passage variants were antigenically smooth strains of *Br. abortus*. The 18th and 20th passage variants showed all the characters of rough strains; saline suspensions of these variants flocculated out rapidly at room temperature even when the salt concentration was reduced to 0·1 per cent., and on boiling flocculation took place in one or two minutes. Guinea-pigs inoculated with the 20th passage variant have never shown agglutinins for smooth strains of *Br. abortus*.

The original strain and its variants grew as readily in air as in an atmosphere containing an increased concentration of CO_2 and the colonies produced by all were typical for *Br. abortus*.

The antigenic structure of some of the passage strains has been determined by estimating their ability to absorb agglutinins from smooth and rough sera, the absorbed sera being tested in the usual way for residual antibody against the homologous antigen. Both sera were prepared in rabbits, the smooth by the inoculation of a fully virulent strain (817), and the rough serum by the inoculation of the 20th passage variant referred to above. The results are shown in Table I, from which it is clear that the original strain, together with the 6th, 13th, 30th and 40th passage variants are predominantly smooth, while the 16th and 20th passage variants are predominantly rough. Absorption tests have not been made with the 18th passage variant.

TABLE I.

Indicating the Antigenic Structure of some of the Passage Variants.

Serum abs. c.	Titres after Absorption.	
	S serum Tested *vs.* S suspension.	R serum Tested *vs.* R suspension.
Unabsorbed control ...	1 : 2048	1 : 128
Unpassaged strain 45...	1 : 16	1 : 128
6th passage variant ...	1 : 32	1 : 64
13th " " ...	1 : 32	1 : 128
16th " " ...	1 : 2048	1 : 16
20th " " ...	1 : 2048	1 : 16
30th " " ...	1 : 32	1 : 128
40th " " ...	1 : 32	1 : 128
817	1 : 8	1 : 128

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Two points need to be mentioned in this connection. At first great difficulty was experienced in obtaining stable suspensions of the rough variants, but after trying out various solutions it was found that N/250 NaOH, as recommended by Robinson and Peeney (1936) in their studies on *C. diphtheriae*, gave perfectly stable suspensions which would even resist boiling for two hours. In all subsequent studies involving rough variants, the organisms have therefore been suspended in N/250 NaOH and serum dilutions made in the same fluid. The only drawback to this method is that owing to the greatly reduced electrolyte concentration the titre of the serum is greatly reduced. Concentrations of NaOH much greater than N/250 cannot be used since they cause lysis of the bacteria.

The second point to be mentioned concerns the limitations of the "mirror test." In Table I a mirror test has, in fact, been done between the 20th passage variant and strain 817. This test would suggest that the former strain is completely rough while the latter is completely smooth. But the inoculation of the 20th passage variant into rabbits (though not in guinea-pigs) stimulates the production of agglutinins for smooth strains often to a titre as high as for the homologous strain. It must be concluded, therefore, that suspensions of this variant contain some trace of smooth antigen.

When the tissues of vaccinated animals which had received a test inoculation of a CO_2 sensitive strain were cultivated, cultures were prepared in duplicate, one set being incubated in 10 per cent. CO_2 and the other in air. The presence of growth in a culture incubated in 10 per cent. CO_2 and its absence from the corresponding culture in air was taken as evidence that the guinea-pig was infected by the test inoculation strain but not by the aerobic vaccine strain. When growth occurred on both cultures, the growth in air was regarded as due to the recovery of the vaccine strain, but the growth occurring in 10 per cent. CO_2 might be either the vaccine strain or a mixed growth of the vaccine strain and the CO_2 sensitive test strain. In such cases a number of colonies were examined for their CO_2 sensitivity and those which were not CO_2 sensitive were regarded as representatives from the vaccine strain, whereas CO_2 sensitive colonies were assumed to be derived from the test strain.

In the tables recording the results of the experiments, the recovery of the CO_2 sensitive strains only is recorded, but as a footnote mention is made of the persistence of the vaccine strain when this occurred.

Experiment No. 1

In the first experiment a comparison was made on the immunity of groups of guinea-pigs vaccinated with the original strain, the 13th,

Table II.

Vaccine.	Amount.	No. of Guinea-pigs inoculated.	Average Spleen weight in grammes.	No. with infected			Total per cent. infected.	Titres.
				Spleen.	Liver.	Kidney.		
Original 45	Brown's tube 4 2 c.c.	9	1·44	6	1	0	66	(1) 1 : 1280 (1) 1 : 640 (1) 1 : 320 (2) 1 : 160 (2) 1 : 40 (1) 1 : 20 and one neg. at 1 : 20.
13th passage variant	,,	10	0·83	4	0	0	40	(1) 1 : 1280 (1) 1 : 640 (1) 1 : 320 (2) 1 : 80 (2) 1 : 20 (3) neg. at 1 : 20.
18th passage variant	Brown's tube 4 4 c.c.	10	0·92	4	0	0	40	(3) 1 : 80 (1) 1 : 40 (1) 1 : 20 (5) neg. at 1 : 20.
Controls	—	9	1·84	8	3	3	89	(1) 1 : 5120 (5) 1 : 640 (1) 1 : 320 (1) 1 : 160 (1) neg. at 1 : 10.

Of the guinea-pigs vaccinated with the 18th passage strain four were infected with the vaccine strain only and were regarded as free from infection with the test strain.

and 18th passage variants, the result being given in Table II.

Four weeks after vaccination a test dose of culture consisting of one drop (0·05 c.c.) of a suspension of a virulent CO_2 sensitive strain equivalent in opacity to Brown's Tube No. 4 and diluted 1 in 10^4 was instilled on to the eye. There was evidence that the controls were not infected by this dose, the sera showing no agglutinins, and twelve weeks after vaccination the vaccinated animals and a fresh group of control guninea-pigs were inoculated with the same virulent strain, each guinea-pig receiving 1 c.c. subcutaneously of a culture equivalent in opacity to Brown's Tube No. 4 diluted 1 in 10^6. The guinea-pigs were killed and examined seven weeks later.

The results of experiment 1 indicate that the vaccinated animals possess a greater resistance to infection than the controls; furthermore, the animals vaccinated with the passage variants appear slightly more resistant than those inoculated with the original unmodified strain. The low agglutination titres shown by the guinea-pigs vaccinated with the 18th passage variant are interesting in view of the fact that vaccination with this strain alone produced no agglutinins in the majority of guinea-pigs.

Experiment No. 2

Female guinea-pigs were used in the second experiment. After they had been vaccinated and before receiving the test inoculation male animals were introduced into the runs and the animals allowed to breed.

It has already been pointed out that after gestation has terminated abscesses are frequently found in the uteri of guinea-pigs infected during pregnancy and that in *Br.*

Table IIIa.
Animals infected by Instillation of Virulent Culture on to the Eye.

Vaccine.	Amount.	No. of Guinea-pigs Examined.	Spleen Cultures.			Average Spleen weight in grammes.	Per cent. Infected of those Examined.	Titres.
			Positive.	Negative.	Contaminated or not sown.			
Original 45	Tube 4 1 c.c.	15	15	0	0	1·87	100	(13) 1 : 640 (1) 1 : 320 (1) 1 : 160
6th passage variant	„ „	16	11	3	2	1·80	79	(16) 1 : 640
13th passage variant	„ „	12	11	1	0	1·53	92	(10) 1 : 640 (1) 1 : 160 (1) not tested
20th passage variant	„ „	15	7	8	0	1·35	47	(2) 1 : 640 (4) 1 : 160 (2) 1 : 80 (1) 1 : 40 (1) 1 : 20 (2) 1 : 10 (3) neg.
Controls	—	14	13	1	0	3·01	100	(13) 1 : 640 (1) 1 : 320

1 : 640 was the highest dilution of serum tested.

Table IIIb.

Vaccine.	Abscessation of Uterus.		Pregnant Uterus.		Normal not Pregnant Uterus.		Percentage of Aborting or Pregnant Guinea-pigs infected in Uterus.	Percentage of all Guinea-pigs infected in Uterus.
	Cultures +	—	Cultures +	—	Cultures +	—		
Original 45 ...	5	1	0	2	0	7	75	40
6th passage variant	5	1	1	3	0	6	70	44
13th „ „	4	1	1	1	0	5	86	50
20th „ „	2	0	1	7	0	5	30	20
Controls	5	2	0	2	1	4	78	57

Abscessation of the uterus irrespective of whether *Br. abortus* was or was not isolated is regarded as evidence of a uterine infection.

abortus experiments abscesses in the uterus may be accepted as evidence of *Br. abortus* having infected the uterus even though that organism is not recovered from the abscesses on cultural examination. (McEwen and Roberts, 1936).

Some of the vaccinated animals were infected by subcutaneous inoculation of the virulent strain while others were infected by instilling a drop of culture on to the eye. The animals infected in these ways are grouped separately separately in Tables III (*see previous page*) and IV and each Table is sub-divided into two parts (*a*) showing the results of the usual bacteriological examinations and (*b*) showing the results of the examination of the uteri.

The animals were infected 10½ weeks after vaccination, those infected subcutaneously receiving 1 c.c. of a suspension of strain 544 equivalent to Brown's Tube No. 3 diluted 1 in 10^7 and those infected in the eye receiving one drop of a similar suspension diluted 1 in 10^4.

In this experiment groups of guinea-pigs were vaccinated respectively with the original strain, and with the 6th, 13th and 20th passage variants.

From Tables III and IV it would appear that the infection via the eye was a more severe test than the subcutaneous inoculation, but irrespective of the method of infection the guinea-pigs vaccinated with the original strain appear as less resistant than those vaccinated with variants from that strain. Indeed, except for the fact that among the eye-infected guinea-pigs those vaccinated with the original strain had smaller and lighter spleens than the con-

Table IVa.

Animals infected by subcutaneous inoculation of virulent culture.

Vaccine.	Amount.	No. of Guinea-pigs inoculated.	Spleen Cultures.			Average Spleen weight in grammes.	Titres.	Per cent. infected.
			Positive.	Negative.	Contaminated or not sown.			
Original 45	Tube 4 1 c.c.	13	11	0	2	1·45	(8) 1 : 640 (3) 1 : 320 (1) 1 : 160 (1) 1 : 80	100
6th passage variant	„	16	5	10	1	0·71	(1) 1 : 640 (4) 1 : 320 (2) 1 : 160 (6) 1 : 80 (1) 1 : 40 (2) 1 : 10	33
13th passage variant	„	11	1	7	3	1·69	(2) 1 : 320 (6) 1 : 40 (3) 1 : 10	13
20th passage variant	„	13	3	10	0	0·96	(1) 1 : 160 (1) 1 : 20 (11) neg. at 1 : 10	23
Controls ...	—	15	15	0	0	1·50	(8) 1 : 640 (5) 1 : 320 (2) 1 : 160	100

1 : 640 was the highest dilution of serum tested.

Table IVb.

Vaccine.	Abscessation of Uterus.		Pregnant Uteri.		Apparently Normal not Pregnant Uteri.		Percentage of Aborting or Pregnant Guinea-pigs infected in Uterus.	Percentage of all Guinea-pigs infected in Uterus.
	Cultures		Cultures		Cultures			
	+	—	+	—	+	—		
Original 45 ...	5	1	2	4	0	1	75	62
6th passage variant	0	0	0	9	0	6	0	0
13th „ „	0	1	0	4	0	6	20	9
20th „ „	1	0	0	7	1	4	13	15
Controls	2	1	2	2	2*	6	71	47

* In one of these cases the uterus had recently been pregnant and involution was incomplete.

trols there is no difference between the two groups. On the other hand the animals vaccinated with the different variants all possessed a greater resistance than those vaccinated with the original strain. Where results are judged solely on the presence of infection in the body, the most constant results are given by the animals inoculated with the 20th passage variant, irrespective of the method of infection. The animals vaccinated with this variant also showed the least agglutinin production.

The extent of the uterine infection in the different groups does not conform exactly with the extent of the splenic infection in the same groups, although it should be noted that when the uterus was found infected the spleen was invariably infected. It is surprising to find that none of the animals vaccinated with the 6th passage variant and infected by subcutaneous inoculation showed any uterine infection. On the whole, however, where the groups infected subcutaneously and by the eye are considered together those animals vaccinated with the 20th passage variant show the lowest incidence of uterine infection.

Experiment No. 3

An experiment comparable to the preceding one was carried out on male guinea-pigs but the original strain was passaged once through a guinea-pig before being used as a vaccine, the vaccine being made from the second generation recovered from the guinea-pig. Groups of guinea-pigs were vaccinated once with the 1st, 13th and 20th passage variants. A number of the vaccinated animals were given a test inoculation of virulent strain 544, 7½ weeks after vaccination, consisting of the subcutaneous inoculation of 1 c.c. of a suspension equivalent in opacity to Brown's Tube No. 3 diluted 1 in 10^7, with the results shown in Table V. The remainder received a comparable test inoculation 14 weeks after vaccination, with the result shown in Table VI (*overleaf*).

It will be seen that the animals in Table V appeared to receive a heavier infective dose than those in Table VI. In both groups of guinea-pigs, however, the superior resistance of the animals vaccinated with the 20th passage variant is evident. Unfortunately, among those guinea-pigs vaccinated with this variant and infected 7½ weeks after vaccination the vaccine strain was persisting in the spleens of six out of nine animals at the time of slaughter, but there was no evidence of the recovery of the CO_2 sensitive test strain from any of the animals. There was little to distinguish between the results of inoculation with the 6th

Table V.

Male guinea-pigs infected by subcutaneous inoculation 7½ weeks after vaccination. Killed and examined 5½ weeks after receiving the test inoculation.

Vaccine.	Amount.	No. of Guinea-pigs inoculated.	Average Spleen weight in grammes.	No. with infected Spleens.	No. with non-infected Spleens.	No. with Spleen Cultures contaminated.	Percentage infected.	Titres.
1st passage variant	Tube 4 1 c.c.	10	1·24	7	2	1	78	(3) 1 : 640 (3) 1 : 80 (4) 1 : 40
6th „ „	„	10	1·35	4	6	0	40	(2) 1 : 640 (1) 1 : 320 (1) 1 : 160 (1) 1 : 80 (3) 1 : 40 (1) 1 : 20 (1) 1 : 10
13th „ „	„	8	1·39	5	3	0	63	(3) 1 : 640 (1) 1 : 320 (1) 1 : 80 (1) 1 : 40 (2) 1 : 10
20th „ „	„	9	1·11	0	9	0	0	(1) 1 : 640 (1) 1 : 80 (7) neg. at 1 : 10
Controls	—	9	1·91	9	0	0	100	(6) 1 : 640 (2) 1 : 320 (1) 1 : 160

1 : 640 was the highest dilution of serum tested.

In the case of the guinea-pigs vaccinated with the 13th passage variant one animal was found infected with the vaccine strain only and among those vaccinated with the 20th passage variant six animals were found to be still infected with the vaccine strain only.

Table VI.

Male guinea-pigs infected by subcutaneous inoculation 14 weeks after vaccination. Killed and examined 6 weeks after receiving the test inoculation.

Vaccine.	Amount.	No. of Guinea-pigs inoculated.	Average Spleen weight in grammes.	No. with infected Spleens.	No. with non-infected Spleens.	No. with Spleen Cultures contaminated.	Percentage infected.	Titres.
1st passage variant	Tube 4 1 c.c.	12	1·32	7	5	0	58	(1) 1 : 2560 (1) 1 : 1280 (1) 1 : 40 (9) Neg. at 1 : 20
6th „ „	„	14	1·0	1	13	0	7	(1) 1 : 1280 (2) 1 : 40 (1) 1 : 20 (10) Neg. at 1 : 20
13th „ „	„	12	0·89	1	11	0	8	(1) 1 : 20 (11) Neg. at 1 : 20
20th „ „	„	16	0·85	0	16	0	0	(16) Neg. at 1 : 20
Controls	—	12	2·08	7	5	0	58	(1) 1 : 2560 (3) 1 : 1280 (1) 1 : 640 (1) 1 : 320 (1) 1 : 40 (5) Neg. at 1 : 20

One animal vaccinated with the 20th passage variant was found infected with the vaccine strain only.

and 13th passage variants but both were probably superior to the results obtained with the first passage variant. Indeed, vaccination with this variant conferred but slender protection on the animals and among those which received the test dose of virulent culture 7½ weeks after vaccination the only evidence suggesting any increased resistance is furnished by a comparison of the spleen weights, the spleens of the vaccinated being appreciably lighter than those of the controls.

Experiment No. 4

The next experiment was designed to test the effect of vaccinating guinea-pigs with cultures of ascending degrees of virulence. The first vaccination was made with the non-virulent original strain; this was followed at a later date by a second vaccination with the 6th passage variant and still later by a third vaccination with the 20th passage variant.

One hundred and ninety-two guinea-pigs were inoculated subcutaneously with 1 c.c. of the original strain equivalent in opacity to Brown's Tube No. 3. These animals were divided into two groups of unequal size. Thirty-two days later the guinea-pigs in the smaller group received a second inoculation of the original strain and again ten weeks after the commencement of the experiment they were given a third inoculation with the same strain.

The guinea-pigs in the large group, 32 days after first being vaccinated, received a second inoculation but of the 6th passage variant. Four weeks after the second inoculation ten of the animals were killed and only one was found to have an infected spleen. It was therefore concluded that the 6th passage variant was not persisting in the bodies of those animals, except possibly in a few instances, and ten weeks after the first inoculation of vaccine the remaining animals in the group received a third vaccination but with the 20th passage variant. Six weeks later 13 of the guinea-pigs were killed and examined and one was found with an infected spleen. The infection was a very light one and caused by the rough 20th passage variant. As the evidence indicated that the variants were not persisting in the bodies of the vaccinated animals the guinea-pigs in both groups were submitted to immunity tests 8½ weeks after receiving the last dose of vaccine. Four test doses of strain 544 were used, the largest consisting of the intramuscular inoculation of 1 c.c. of a suspension equivalent in opacity to Brown's Tube No. 3 diluted 1 in 10^5, the remainder being similar but diluted to 1 in 10^6, 10^7 and 10^8.

The results of this experiment are summarised in Table VII (*page* 1103).

Table VII

Test Inoculation.	Group 1. G. pigs Vaccinated 3 times with Original Strain 45.				Group 2. G. pigs Vaccinated with (*a*) Original Strain 45 (*b*) 6th Passage Variant (*c*) 20th Passage Variant.				Controls.			
	No. Examined.	Mean Weight of Spleens.	No. Infected.	Per cent. Infected.	No. Examined.	Mean Weight of Spleens.	No. Infected.	Per cent. Infected.	No. Examined.	Mean Weight of Spleens.	No. Infected	Per cent. Infected.
1 c.c. 10^5					21	1·3 gr.	4	19				
1 c.c. 10^6	24	1·32 gr.	7	29	24	0·93 „	3	13	24	1·99 gr.	23	96
1 c.c. 10^7	21	0·98 „	1	5	24	0·88 „	0	0	24	1·17 „	23	96
1 c.c. 10^8									22	1·44 „	10	45

In no single instance was an aerobic strain of *Br. abortus* isolated from any of the guinea-pigs.

From Table VII it is clear that the vaccinated animals were much more resistant to infection than the controls, since those vaccinated on three occasions with the original strain and infected with 1 c.c. of strain 544 diluted 1 in 10^6 showed more resistance to infection than control animals inoculated with a test dose 100 times smaller, and the animals vaccinated with the variant strains possessed a greater resistance to infection than controls which received 1,000 times less infective material.

In no instance was a vaccine strain recovered from an animal examined at the completion of the experiment. It is, therefore, interesting to see whether the preliminary inoculation with the non-virulent vaccine enabled the animals to eliminate from their tissues the vaccination inoculation of the 6th passage variant more rapidly than do normal animals, and furthermore whether the animals vaccinated with the original strain and the 6th passage variant eliminated the 20th passage variant more rapidly than normal control guinea-pigs. The relevant experimental data are summarised in Tables VIII and IX.

The results were inconclusive as regards the animals vaccinated with the 20th passage variant but the indications are that the 6th passage variant is eliminated more rapidly by the animals which had received a preliminary inoculation of the original non-virulent strain.

Six weeks after the third inoculation of vaccine, 13 of the guinea-pigs vaccinated with

Table VIII

Animals killed 4 weeks after Vaccination with the 6th Passage Variant.

Vaccinated with (*a*) Original Strain 45 and (*b*) 6th Passage Variant.			Vaccinated with 6th Passage Variant only.		
No. of Guinea Pigs.	No. of Infected Spleens.	Percentage with Infected Spleens.	No. of Guinea Pigs.	No. with Infected Spleens.	Percentage with Infected Spleens.
10	1	10	12	7	58

Table IX

Animals killed 4 weeks after Vaccination with the 20th Passage Variant.

Vaccinated with (*a*) Original Strain 45, (*b*) 6th Passage Variant and (*c*) 20th Passage Variant.			Vaccinated with 20th Passage Variant only.		
No. of Guinea Pigs.	No. with Infected Spleens.	Percentage with Infected Spleens.	No. of Guinea Pigs.	No. with Infected Spleens.	Percentage with Infected Spleens.
10	8	80	12	12	100

the original strain, and the 6th and the 20th passage variants were killed and examined. Unfortunately there were no animals inoculated with the 20th passage variant only, to act as controls. Only one animal out of the 13 was infected in the spleen. From our experience in other experiments on the time the 20th passage variant persists in the spleens of inoculated guinea-pigs we should have expected a much higher rate of infected spleens had the preliminary vaccinations not been made. It is therefore probable that the two preliminary vaccinations had had an accelerating effect upon the elimination of the 20th passage variant from the bodies of the guinea-pigs.

DISCUSSION

In previous immunisation experiments on guinea-pigs the majority of the animals were vaccinated with strain 45 which had not been passaged through guinea-pigs. In one experiment, however, a comparison of the resistance of animals vaccinated with strain 45 and with the 6th passage variant was in favour of the latter vaccine. That result has now been confirmed as vaccinations with the 6th or other passaged variants higher in the series have given better results than vaccination with the original strain.

This conclusion is confirmed by the statistical analysis of the results. It may be noted that in many cases the numbers in the different experiments are too small to permit the use of the χ^2 test. To obviate this difficulty a number of the individual results were added together and χ^2 tests done on the totals. Criticism of weighting is not pertinent in this case since the figures for the mean of the percentages infected are practically the same as those for the percentages infected calculated from the totals.

The results of experiments shown in Tables II, IVa, V and VI have been summed in this way. The results shown in Tables IIIa and VII were excluded because an entirely different technique was adopted.

Summarising the results, it may be said that there was no difference in the infection rate between the controls and those animals vaccinated with the unpassaged original strain, that the 6th, 13th and 20th passage strains all gave a significant degree of protection (P being less than 0·01 in each case), that the 6th and 13th passage strains showed no difference in immunising ability and that the 20th passage strain showed more immunising ability than the 13th but not more than the 6th passage strain.

It may be noted from these totals that the 20th passage strain gives about 90 per cent. protection, and that the 6th passage strain gives about 70 per cent. protection. Moreover, in each experiment the 20th passage strain gives slightly more protection, yet the difference, as judged by χ^2, is not significant, the probability being 0·068. Similarly the difference between these two strains in Table IIIa is not significant by the χ^2 test, the probability being 0·126. But if the two probabilities are combined, by the method outlined by Fisher (1932), the corrected value of χ^2 becomes 9·5196 which for four degrees of freedom gives a value of P approximately equal to 0·05. It may be concluded, therefore, that there is a real, though perhaps slight difference in the immunising ability of the two strains.

In some of the earlier experiments a definitely increased resistance to infection had been obtained by vaccination with the original strain (McEwen and Roberts, 1936). It might therefore appear that since the earlier experiments were made there had occurred a deterioration of the immunising properties of the strain. These earlier experiments had been made with vaccine prepared from generation X21 or from earlier generations of the strain. Since then the strain at generation X27 was dried and preserved and the subsequent vaccination experiments were carried out with the second generation of subculture from the preserved material. It is unlikely that the strain underwent any antigenic deterioration during the six generations before preservation. We have found that other strains of *Br. abortus*, similarly preserved, retain their characters of virulence, CO_2 sensitivity and antigenic structure as judged by agglutination and agglutin absorption tests, it is therefore unlikely that preservation would have effected a change in the strain. That a deterioration in the immunising properties of strain 45 may be more apparent than real is suggested by the final experiment (Table VIII) in the present series where only 5 per cent. of the animals vaccinated with the original strain failed to withstand an infection sufficiently severe to infect 96 per cent. of the controls.

The vaccination immunity of the guinea-pig to a *Br. abortus* infection is not of a high grade and experiments in which the only criterion of immunity is the complete absence of infection will sometimes fail to show degrees of immunity or resistance demonstrable by comparisons of the extent of infection in vaccinated and control animals respectively. In the present series of experiments the animals vaccinated with the original strain showed, on the whole, a lighter infection of the spleen, and their spleens were not as enlarged as those of control animals. There is therefore reason to believe that the vaccination had increased their resistance to infection.

A most interesting feature of the experiments is the resistance shown by animals vaccinated

with the rough 20th passage variant. Although this rough variant still possessed some trace of smooth antigen this was insufficient to cause the production of demonstrable agglutinins in vaccinated guinea-pigs or to absorb agglutinins from smooth serum. That the guinea-pigs vaccinated with this rough variant should be more resistant than animals inoculated with smooth strains and showing agglutinins in their serum, suggests that these agglutinins are not necessarily of significance in immunity to *Br. abortus*. This finding confirms the frequent observation that suspensions of dead *Br. abortus* inoculated into animals, while stimulating the production of agglutinins, do not stimulate any obvious degree of immunity.

As the experiments showed that vaccination with the 6th and 13th passage variants was more effective than with the original strain it may be asked whether those strains of *Br. abortus* of some degree of virulence possess an antigen absent from or only present in small quantities in the unpassaged and least virulent strain; or is the greater resistance of the animals vaccinated with the passaged variants merely due to their persistence in the tissues for more prolonged periods. If it be postulated that the strains of some virulence possess a specific antigen it is probable that this is destroyed when the bacteria are killed (in this connection see Priestley 1937) since no satisfactory immunity has been demonstrated in guinea-pigs vaccinated with killed cultures of *Br. abortus*. Should this be so it may be difficult to obtain any definite proof of the presence or absence of a specific antigen in virulent cultures as there are obvious difficulties in interpreting the results where living bacteria are inoculated. The final experiment in the present series suggests that it is the prolonged stimulation of the tissues, rather than a hypothetical antigen specific to strains possessing some degree of virulence that is responsible for the enhanced resistance. Guinea-pigs inoculated three times with the original strain at intervals of a few weeks and therefore subjected to the effects of a more prolonged exposure were found to have a degree of resistance more nearly comparable to that of animals vaccinated with the 6th and 20th passage variants.

The general trend of these experiments is in conformity with the results obtained by Cotton (1932; Cotton and Buck, 1933), who vaccinated calves with three strains of *Br. abortus* each of a different degree of virulence. The calves vaccinated with the two more virulent strains had a greater resistance to infection than those receiving the least virulent strain.

Experiments of the type now recorded on guinea-pigs are useful in so far as they may indicate further lines for research and may provide some starting point for vaccination experiments on cattle.

The original strain 45 has been shown to cause neither infection of the pregnant uterus nor of the udder when large numbers of the bacteria are inoculated subcutaneously into pregnant non-infected cattle (McEwen, 1937). This strain may therefore be used for the vaccination of even pregnant cattle without danger of setting up infection. The superior immunity obtained in guinea-pigs by vaccination with passaged variants suggests that cattle might be more effectively protected by similar vaccination. The passaged variants may, however, not be entirely devoid of danger for fully susceptible pregnant cattle. Indeed, we have conclusive evidence that the 20th passage variant when inoculated in sufficient numbers into susceptible pregnant cattle can cause infection, although this variant produces no lesions in guinea-pigs and is eliminated relatively rapidly from their bodies. The primary vaccination of pregnant cattle with cultures of *Br. abortus* of even relatively low virulence may not be practicable, but the experiment on guinea-pigs where primary vaccination was made with the original strain and followed by vaccination with the 6th and later with the 20th passage variants suggests commencing vaccination experiments on cattle with one or more inoculations of a completely non-virulent strain such as strain 45, and following this up with further inoculations of vaccines of graded virulence, thereby progressively enhancing the resistance without infecting the animals.

Summary

By serial passage of the non-virulent strain 45 of *Br. abortus* through guinea-pigs its virulence has been progressively restored.

Guinea-pigs have been vaccinated with the original strain 45 and with relatively non-virulent variants of the strain obtained by guinea-pig passage.

The animals vaccinated with one or other of the passaged variants which had regained some slight degree of virulence were more resistant to infection than animals vaccinated with the original non-virulent strain.

Vaccination with the passaged variant possessing the highest degree of virulence conferred the highest degree of protection. This variant was rough and vaccination with it did not stimulate demonstrable smooth agglutinins in guinea-pigs. It is therefore concluded that an actively produced resistance to *Br. abortus* infection has not any dependence on smooth agglutinins and that there is not necessarily any relation between the antigen responsible for the stimulation of smooth agglutinins and those properties of the

(*Concluded at foot of col.* 1, *page* 1106.)

Clinical Manifestations of Brucellosis Associated with Farm Stock*

F. CHAMBERS, O.B.E., F.R.C.V.S.
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The term Brucellosis covers, as you are aware, affections of man and animals caused by infection with one or other of the Brucella group of organisms. The two that concern us are the *Br. abortus* and the *Br. melitensis*. The latter affects goats and in man causes Malta fever whilst infection by the *Br. abortus* causes undulant fever.

It has been known for many years that contagious bovine abortion is due in the majority of instances to infection by *Br. abortus*. Infection is usually through the mouth and results in drastic pathological changes taking place within the uterus, followed by the premature expulsion of the foetus. The death of the calf is in itself a direct loss to the stock-owner but this is really a small matter compared with the damage that the retention of placental membranes causes to the mother. Metritis, either acute of chronic, may follow, causing death or reducing the cow to such a low state that it is months before she regains the normal.

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The milk yield is sadly diminished and if retention of the afterbirth occurs, the cow seldom comes to her full yield of milk. Often retention of placenta with metritis will cause tuberculous lesions to flare up in the lungs with the result that death soon occurs from acute tuberculous broncho-pneumonia. It is sometimes estimated that the act of abortion causes a dead loss of from £7 to £10 to the owner: I think that it is generally acknowledged that the biggest loss lies in the great percentage of cases that become permanently sterile after abortion.

I do not know if the *Br. abortus* is responsible for the damage done to the fallopian tubes causing salpingitis or if the damage is caused by the invasion by secondary pus-forming organisms. Infection of the uterine mucosa with its attendant damage must also play an important part in causing sterility, for a chronic metritis must render the uterine mucosa incapable of nursing the fertilised ova. In cases where the ovaries are damaged infection may be direct from the uterus or may take place from the blood stream. The presence of cystic ovaries will cause sterility and it has been my experience that this condition is much more prevalent in herds where abortion exists than in clean herds. Bertrand and Schnoenaers[1] state that they examined 109 bovine ovarian cysts obtained from the abattoir for bovine brucella agglutinins in the cystic fluid. Brucella were not obtained culturally but agglutinins were found to be present in 15 out of 85 examined. An attempt was made to produce cysts in guinea-pigs by the intra-ovarian inoculation of a suspension of *Br. abortus* with negative results. It can always be assumed that the infection had died out of the cystic ovary by the time these investigators got their material. Much has been written regarding the excretion of *Br. abortus* in the milk. While it is known that this organism is excreted in the milk of an abortee for months in certain cases, we cannot associate the spread of the disease with this phenomenon for few cows run their milk out whilst grazing. This depressing habit usually takes place when the cows is tied up for milking but I am of the opinion that the presence of the *Br. abortus* in the udder does cause pathological changes in that organ. Excretion of *Br. abortus* in the milk has been studied by Stockmayer[2] and he found that whilst the degree of excretion varied considerably in individual cows, it was the general rule that the largest number of organisms were shed during the early stages of lactation and by first-calf heifers. The extent of the excretion did not depend upon whether the cow had aborted or not. This has been my experience, for quite recently *Br. abortus* was found in the milk of an accredited herd and it was found

bacterial cells which stimulate resistance to infection. It is possible that these latter are possessed in greater quantity by strains of some degree of virulence than by non-virulent strains. On the other hand, the longer persistence of strains of some degree of virulence in the tissues, rather than any specific quality associated with virulence, may be responsible for the superior immunising properties of these strains over a non-virulent strain.

The experiments suggest that guinea-pigs may have their resistance gradually enhanced by successive vaccinations with strains of gradually increasing degrees of virulence and the possibility of adopting a similar procedure in the immunisation of cattle.

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that two cows were passing out large numbers of bacilli in their milk. One had aborted three months previously whilst the second cow had never aborted. Animals that are excreting generally give high blood and whey agglutination titres whilst those showing low titres rarely excrete and if they do, then only spasmodically. The duration of excretion also varies widely sometimes lasting the whole lactation period. Lamont[3] examined milk from a herd of 50 reactors and found that 38 per cent. excreted bacilli.

Severe cases of mastitis occurring before calving are, in my opinion, in a percentage of cases due to damage done by the *Br. abortus* to the parenchyma, causing its resistance to be weakened and allowing organisms that we associate with mastitis to get the upper hand, causing the severe changes and pathological condition so well known. In these cases the whey-like discharge from an affected quarter has the characteristic odour of a retained abortion placenta. On several occasions I have taken samples of milk from cases of this kind and the laboratory has isolated *Br. abortus* by cultural or biological means, usually accompanied by staphylococci. I do not suggest that the *Br. abortus* is responsible for the actual mastitis but I do suggest that the presence of a mass infection of the organism does weaken the defensive powers of the udder tissues and allows secondary invaders to get to work.

In April, 1930, in a herd where abortion was present, a third-calver seven months pregnant developed in one quarter an acute mastitis of a very painful type. Whey from the affected quarter had a disagreeable smell. Microscopically only *Staph. aureus* could be found but the whey was positive to the agglutination test. The cow aborted three days after the mastitis appeared. *Br. abortus* was recovered from the whey by biological test.

In May two more cows showed mastitis on one or more quarters. *Br. abortus* was recovered from the udder discharge of one of the cows and both cows eventually aborted.

Another evil of brucellosis is the causation of big knees and other forms of joint trouble in cows. At one time it was thought that the bruising of the knees against mangers was the cause. This may certainly be a predisposing cause but in a large number of cases it is the pathological action on the secreting membrane of the bursa by the *Br. abortus* that causes the production of the large quantities of fluid that are found in these cases, in which *Br. abortus* can often be found in pure culture. Other joints to be affected are the hock, stifle (unilateral) and fetlocks. In the hock the inflammatory process may be acute or chronic but the disturbance to health is not so severe as when the stifle is affected. When this joint is affected there is usually severe constitutional disturbance—milk yield decreases and very soon the animal becomes a wreck. The same applies when the hind fetlock joints are affected. There is evidence of a true arthritis with ulceration and erosion.[4] It is possible that those distressing cases of gonitis in the horse are due to a similar cause but I regret that I have not had the blood of those cases that I have seen, tested for agglutinins; yet most of the cases have occurred on farms where abortion was rife. Magnusson[5] in an article on Brucellosis and its relation to Bursitis in Cattle, described the results of the examination of 1,250 cattle of the same type and from the same area of country: 203 were affected with bursitis. The agglutination titre of the blood of all cattle not affected with bursitis was ascertained; in affected cattle the titre of blood and that of bursal fluid were tested.

The results, briefly, were:—

Cattle not affected with bursitis, 1,047; 12 per cent. of these gave positive reactions.

Cattle affected with bursitis 203; 39 per cent. of these gave positive reactions. *Br. abortus* was found in the bursal fluid in eleven cases.

In recent cases of this kind where there is much pain but not a great deal of swelling, in addition to antiphlogistic measures I have been in the habit of injecting one or two doses of killed abortus vaccine and the results have been very promising. In the case of hygroma where the swelling is large and obviously containing large quantities of fluid with or without fibrin balls, a free incision, in the case of knees at the side, is indicated. The removal of the fluid by a trocar and cannula followed by the injection of a quantity of 10 per cent. potassium iodide solution will act as well, but it is not so easy to do and may sometimes end in a "rough house." I find that the best time to incise big knees is when the cows are out at grass. Infection of the joints, often called "body garget," may follow retention of the placenta or an attack of mastitis. I do not think that many cases of joint trouble are due to infection from mastitis where the disease is of pure staphylococcal or streptococcal origin, for one seldom sees "body garget" in an outbreak of streptococcus mastitis.

In the horse infection by *Br. abortus* is stated by some authorities[6] to be, in a big percentage of cases, the cause of poll-evil and fistulous withers. It is known that the *Br. abortus* can be obtained in pure culture from the discharges from such cases and literature has been published stating that complete cures have resulted from the injection of one or more doses of killed anti-abortion vaccine of equine strain. At one time I was of the opinion that this treatment had cured several unopened types of fistulous withers but in every case after a

period of from six to nine months these cases flared up again and eventually the radical operation was necessary to complete the cure. I consider that practically every case of fistulous withers and poll-evil is due to infection by the *Onchocerca cervicalis* of the ligamentum nuchae, but undoubtedly the soil is prepared and made more acceptable by the activities of the *Br. abortus*.

Deem[8] examined blood sera from 189 horses attending a veterinary clinic and found that in 34 cases of fistulous withers and poll-evil 83·3 per cent. gave positive reactions. In conditions other than the foregoing, 155 were examined and 18·7 per cent. gave positive reactions. One hundred and three apparently normal horses were examined and 9·7 per cent. gave weak positive reactions.

The injection of several doses of killed equine *Br. abortus* vaccine after removal of all dead and excessive ligamentous adventitious tissue, does help tremendously and hastens healing, and here and now I should like to express my thanks to the Ministry's laboratory for their kindness in supplying vaccine to me.

There is no need to draw blood for an agglutination test in the horse. Inject a small quantity of the vaccine in the neck and the reaction in a positive case can be seen the next day without any difficulty! What are known as "blind boils" on the crest of the neck where the collars touches clear up very quickly after giving one or two injections of anti-abortion vaccine. Last year I had two young horses go lame with a type of sesamoiditis. Both were on farms where abortion was rife. It would appear that the synovial bursa in the sesamoid region was affected. Both were positive for *Br. abortus* and both responded to vaccine treatment to a great extent but permanent enlargement in that region was left.

I have not attempted to discuss the treatment of contagious abortion in cattle. It is too large a subject to be dealt with in the time at our disposal, but suffice it to say that I consider the only method to get rid of this foul disease is by blood testing and removal of reactors. I know that to commence with it is a costly business and the majority of farmers affected could not possibly afford to carry out this method of eradication. In those herds from which I have eliminated contagious abortion the owners have invariably stated that the results have been worth every penny that it has cost. I have had such mixed results from the use of living vaccines that I gave up the use of them. Dead vaccines and the various forms of dead vaccines incorporated with dyes have been valueless in my hands. I have great hopes that one of the sulphanilamide preparations may be the one drug that we have all been looking for that will cure abortion and Montgomerie's[7] recent work on this subject seems to hold out hope in this direction. My first and only experience of one of the well-advertised killed abortus *cum* dye vaccines was not very helpful. The herd consisted of 27 cows. Several abortions had taken place. Blood was taken from all of them and subjected to the agglutination test. Twenty-one were positive and six negative. The six were injected with the vaccine and *all* aborted. Two reactors that could not be got in calf were injected. Both held to the first service and carried their calves to full time!

We do know that the disease will die out in three years or so provided that no fresh cows or pregnant heifers are introduced into the herd. One or two abortions will probably give a complete immunity whilst the ones that are left sterile are fattened off. Calves and heifers, being in constant association with the disease, do acquire immunity whilst barren, having a non-receptive uterus. It is known that very few infected adults recover and give permanently negative reaction to the agglutination test. Mitchell[9] after studying this question in several large infected herds, states that the figures are about 3 per cent. Calves, on the contrary, usually recover though 15 per cent. remain permanently affected. With very few exceptions animals giving positive serological reactions are definitely infected with the *Br. abortus*.

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Discussion

Mr. H. Taylor, opening the discussion, said: It gives me great pleasure to welcome Major Chambers, and I accord him, on your behalf, a hearty vote of thanks for a very excellent paper. (Applause.) Although not long, it has no doubt meant a good deal of reading and looking up books and periodicals.

Abortion is one of the bugbears of the veterinary profession, and it is a problem to know what to do with it. The ideal way seems to be to test the animals and for all reactors to be put on one side; nine out of ten farms, however, cannot afford to adopt this method.

There seem to be no new methods of detecting abortion. The agglutination test has many shortcomings, and is not by any means perfect. A cow with abortion may not respond to the agglutination test under three or four weeks and

a cow may be positive and yet calve normally.

It is claimed that an agglutination test of 1:100 is positive: yet blood samples sent to a laboratory agglutinate 1:750 and 1:500.

Are there carriers in the question of abortion? We sometimes find that there is a flare-up of abortion in a herd and it is difficult to account for this unless there has been a carrier. Infection occurs chiefly by mouth. Bulls are not often affected.

A lady client of mine had 15 Jerseys kept for her own use. She bought a bull from the Island and for 15 years she had no fresh animals on the place, except the bull. One cow slipped her calf and I decided to test the animal, and curiously enough it reacted. Months afterwards, the cowman remarked that they had allowed a neighbouring farmer to use the grass and their own cows were turned out on it three weeks afterwards.

The question of sterility is another big problem. If asked to use a live vaccine, one must be prepared to have numbers of cases of sterility. In some breeds of cattle no vaccination of any sort is allowed—not even for exportation abroad—the authorities forbid this.

How do calves get immunity when the predilection site of the brucella is in the pregnant uterus, and are they immune for life?

My experience with fistulous withers had been limited, and I did not associate big knee with *Brucella abortus* infection until I saw an article in the *Record* some years ago. I was asked by a gentleman who had abortion on his farm to take milk samples for agglutination test: not one proved positive, although abortion was rife on his farm.

Mr. Sam Smith said that abortion was undoubtedly the biggest curse of the dairy farmer. He had come to the conclusion that to try and persuade the owner to go in for isolation was useless, as they could not stand it—the expense was too great and the labour question too difficult. In his opinion, the only thing was the live vaccine. He would like to ask Major Chambers how long after one had taken a blood sample was the result to be relied on? The Ministry said that one had to wait 14 days after the act of abortion before taking the blood sample. He was surprised when Dr. Stableforth said it was entirely unnecessary, and that only four days was sufficient.

Mr. J. B. Dier having thanked Major Chambers for his paper, observed that abortion was undoubtedly a great bugbear to the profession. He thought the best method was to separate the herd into two parts, but this was impossible for most owners. In regard to the live vaccine, he had given it up with the exception of one client. The Ministry would not allow anyone to use the live vaccine on attested or tuberculin tested cattle: he thought this method probably produced a lot of carriers, while disposal of cattle into other herds would lead to so much spreading. With regard to agglutination tests, he had several times sent blood away for a test and also taken samples with the abortoscope, and he had found the latter almost as reliable as sending the blood away; in fact, he would rather trust to the abortoscope. He now recommended Nator B in preference to live vaccine.

Mr. S. E. Holmes said that there were cows which, although they gave a positive reaction, did not abort. Were those cows a danger in the herd?

Dr. Jordan having said that he very much appreciated Major Chambers having come such a long way to give them a paper, observed that it was undoubtedly true that the after-effects of abortion, that is, sterility, loss of milk, etc., were greatly feared by farmers, probably in fact more than those of any other disease with which they had to deal. With reference to Major Chambers' remark that a cow affected with tuberculosis would go downhill very much more rapidly, he thought this was probably a blessing in disguise rather than a drawback, as its condition would then become obvious and a dangerous animal would be removed from the herd. They must be careful not to blame all forms of sterility on to abortion: there was a possible inclination to-day for many people to do this. It was a pity that very often the wrong type of cow was being bred from: instead of using the progeny of the old cow that had successfully raised a calf every year but had herself probably only given a moderate milk yield, farmers bought in a cow with a very high milk yield and then, although they might have to wait two or three years before they got a calf from this cow, if it were a bull they probably used it as their stock bull.

With reference to fistulous withers and abortus bacilli, where did town horses acquire their infection?

He thought the control of abortion was very difficult—far more difficult in fact, than the control of tuberculosis. In Scotland he was very actively connected with the Abortion Eradication Scheme which was introduced a few years ago. There, herds were self-contained, premises were first-class and he had a good deal of success following isolation of reactors. On the other hand, however, at a farm in West Sussex they had again started the eradication plan and at one time only one reactor was left on the place and this rigidly isolated. A neighbour's stock, however, had abortion and a footpath ran from this man's pastures through the farm in question and soon after no less than 24 animals on this farm aborted. It was an unfortunate fact that the man with an abortion-free herd had possibly as much cause to be apprehensive as the man whose cows are actually aborting, as no one would deny that a free herd was particularly susceptible to infection and when once infection got a hold in such a herd it was extremely difficult, if not impossible, to check it. He had had quite a lot of experience with the use of the live vaccine and in many cases it was the only thing which one could conscientiously advise. In his own experience he would like to say that he considered that, in some circumstances, far more than 3 per cent. of the reactors become non-allergic.

Mr. Blount, after congratulating Major Chambers on the excellence of his paper, gave a brief review of some of the facts relative to undulant fever in man. Especially interesting was the fact that Sir Weldon Dalrymple-Champneys (one of the leading authorities on undulant fever in this country) was now of the opinion, following recent research work, that one important personal factor in the resistance to undulant fever was dependent upon the

concentration of hydrochloric acid in the stomach contents. Dr. L. P. Garrod (*Jour. Path. Bact.* Vol. 45. No. 2. p. 473. 1937) had shown that *Brucella abortus* was more easily killed by dilute hydrochloric acid or gastric juice than any of the other common intestinal pathogens, which suggested that the immunity to infection with this organism was probably due to their being killed in the stomach. Infection of persons who had habitually drunk infected milk as well as those who had become infected at first drinking it, might thus be due to a temporary or permanent achlorhydria. Further work on this point was awaited with interest.

Mr. Blount then asked the essayist a number of questions. (*See* replies by Major Chambers.)

Mr. Balfour-Jones said he found that in a good many cases there were agglutinins in the serum up to titres 1:40, 1:80 and 1:200 and higher, on farms where horses were associated with abortion. He had carried out two or three tests with Brucellin. Results were most disappointing when compared with the agglutination test. Brucellin tests on goats had proved satisfactory in Italian workers' hands.

The Reply

Major Chambers replied to Mr. Taylor's question on his interpretation of the test, as follows: If I get a cow with a titre of 1:40 I consider it dangerous. Cows that react to the test time after time and yet carry their calves to full time are definitely carriers, and that is a cow I would not allow to be kept.

With regard to the causation of sterility by live vaccine, I feel that a lot of ill-feeling has been caused by its use. I have had very good results with live vaccine, and also some bad ones. For example, 24 cows were injected with live vaccine on one farm and every cow aborted!

Mr. Blount has answered Mr. Taylor's question regarding the manner in which calves acquire immunity.

Re the treatment of big knee in cattle, I make a large, bold incision three or four inches in length at the side of the hygroma.

Concerning the taking of blood samples, I consider that if a cow has aborted, it does not matter whether you take samples immediately afterwards or wait several weeks, they will react in both instances.

Live vaccine does produce "carriers."

Personally, I would rather take the word of a good laboratory than the abortoscope, because it seems in the former you have a definite serum dilution. The abortoscope does not seem scientific; however, I would not like to condemn it solely on my own results.

In regard to Nator B, I do not know whether to consider it good or not—yet some people speak highly of it.

Are there different strains of abortion? Yes, *e.g.*, the introduction of a cow from Cumberland into Sussex would bring a different strain and start the whole thing over again.

Sterility in herds that are not affected with abortion may be due to excessive milk production.

Poll-evil is not often seen in towns. I have not seen a case of poll-evil and fistulous withers in town horses for years.

In reply to Mr. Blount's questions:—

(1) *Q.* How long after the corpus luteum has been removed is it before heat occurs?

A. It is very difficult to say. I have seen heat occur in five, sometimes ten days.

(2) *Q.* Do you associate (*a*) pus in the uterus with retention of the corpus luteum, and (*b*) also with cystic ovaries?

A. (*a*) I do not know. (*b*) Yes, I do.

(3) *Q.* Case recommends that if a second corpus luteum requires to be removed, the cow be automatically bulled at the fifth day, irrespective of signs of oestrum: what is your view?

A. I should have thought the cow would have had something to say about that.

(4) *Q.* What substance do you find best for uterine injections as a control of pyometra in cattle?

A. Tincture of iodine mitis.

(5) *Q.* Do you examine sperms for headless varieties in infected bulls?

A. No. I have found only two bulls react to the test.

(6) *Q.* Have you any experience of an intradermal Brucellin test in cattle?

A. No.

(7) *Q.* In bleeding cattle for agglutination tests, do you use the jugular or mammary veins?

A. I prefer the jugular vein, using a one-inch needle, one millimetre bore, attached to a 10 c.c. hypodermic syringe.

(8) *Q.* Do you find any confusion in cattle suffering from trichomoniasis, together with a low positive blood agglutination?

A. No, because I have only seen one outbreak of the latter disease.

(9) *Q.* Do you find pyometra common in trichomoniasis?

A. No.

(10) *Q.* Have you any experience of the whole-blood rapid test?

A. No.

(11) *Q.* Do you still condemn the abortoscope as being unsatisfactory?

A. (*See* above.)

A COURSE IN MEDICAL HISTORY

For the first time, certainly in the United States of America and possibly in the world, a graduate course has been devoted to the history of medicine, we read in a recent issue of the *British Medical Journal*. Henry Ernst Sigerist, Welch Professor of the History of Medicine at the Johns Hopkins University and Director of its Institute, through a carefully planned programme, brought together at Baltimore during the week of April 18th to 23rd a large and enthusiastic group of men and women from the United States and from Canada, among whom were a number of distinguished historians. The morning sessions were devoted to lectures and discussions and included such topics as principles of primitive medicine, Egyptian medical papyri, the Hippocratic problem, Paracelsus and the development of iatrochemistry, new contributions to the history of the circulation of the blood, and the social history of medicine in the nineteenth century. In the informal atmosphere of the afternoons' round-table seminars, attention was primarily focused on problems concerning teachers of medical history, such as the various approaches to its study, the interpretation of medical texts, the history of disease, and the choice of a subject for research.

In view of the interest of veterinary history, revealed in our recent Jubilee Number, it would be a very good thing in the education of the veterinary student and even of the graduate if a short course in veterinary history were likewise instituted at the colleges.

The Veterinary Record
August 27th, 1938.

The International Congress and Veterinary Education

DURING the past week the Thirteenth International Veterinary Congress has met in Switzerland, where veterinarians from all over the world have discussed their mutual problems. So many and varied are these that the discussions are arranged into a general and ten specialised sections. In the general section six papers have been presented; and one of them is directly restricted to a discussion on Veterinary Education but the others impinge upon it.

In the opening meeting, Professor Leclainche aptly introduced his subject with the remark, "the essential objects of veterinary medicine impose upon it frequent adaptations to the variable conditions resulting from the economic and social evolution of human society." After referring to the standard of entry into the profession and the various means that exist in the different countries for governing the profession, he states the principle which is reflected in all the other papers read to this section. Leclainche says: "Medicines and surgery form only one part of a programme of studies which comprise everything that concerns animal production, well being and utilisation . . . hygiene, preventive medicine and curative medicine are intimately bound up and cannot be separated. Veterinary teaching must include, for each species of animal, all that concerns its breeding and upbringing, including genetical conditions, its adequate nutrition and husbandry, and preventive and curative medicine."

These views are strongly reinforced by Professor Stang in his paper on "The Importance of the Veterinarian in Animal Husbandry and in the Production of Food Products of Animal Origin." He says: "The activity of the veterinarian is often supposed to be limited to the treatment of sick animals. In reality, it embraces a much more varied and more extensive domain. Each State has enacted laws regulating the duties associated with veterinary policing, meat inspection, supervision of food commodity markets, the protection of animals, the destruction of carcases and the breeding of animals. The veterinarian must collaborate in the interpretation and application of these laws." In Germany the State laws decree that "the veterinarian must safeguard the health of the German herd and collaborate in its breeding and in increasing productivity." Stang adds "From his professional knowledge the veterinarian is the person best qualified to direct breeding and to lead it into ever new channels." His final conclusion is that "the veterinarian must not be satisfied only with keeping animals in good health; his activities must tend towards the betterment of the economic conditions of the country."

In his paper on the "General Conditions in the Origin and Development of Infectious Diseases," Professor Frei emphasizes the importance of a thorough grounding in physiological and biochemical knowledge to the true understanding of factors associated with animal development and disease control.

Professor Götze, dealing with "Disturbances in Animal Reproduction," illustrates the importance to the veterinarian of a thorough knowledge of animal reproduction and its attendant ills by his statement that "it has been estimated that on German territory from one-fifth to two millions of animals are examined and treated every year by veterinarians for sterility and other ailments of reproduction. Ills of breeding functions caused by faults in care and feeding and by specific infectious maladies play the greatest rôle, and these must primarily be avoided." Professor Lagerlöf, in his paper on the same subject, discusses at length reproductive troubles having their origin with the sire and he further illustrates the breadth of knowledge and experience which the modern veterinarian must possess.

Professor du Toit, in discussing "Conditions in the Origin and Development of Infectious Diseases" again brings this point out vividly in his references to the many factors concerned with transport, soil, vegetation, climate and causal organisms, factors which may influence the onset and control of disease, and which are therefore important to the veterinarian.

These papers, which have been presented to the general section of the Congress, all combine in emphasising the need for comprehensive

studies in the training of the veterinarian and illustrate the impossibility of trying to divorce animal hygiene, husbandry, breeding and nutrition from veterinary medicine. It is to be hoped that the instruction given in our Colleges will soon be adequate to meet the demands made upon the modern veterinarian.

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Imperial Veterinary Conference

AS INTIMATED in the preliminary note published in our last issue, the first Imperial Veterinary Conference was convened by the Executive Council, Imperial Agricultural Bureaux, and held at the Royal Veterinary College, Camden Town, on the 15th to 18th August.

This is an important landmark in veterinary history. The Conference is one of the direct results of the Imperial Agricultural Research Conference held in London in 1927. That Conference recommended amongst other things that a number of special Imperial Agricultural Bureaux should be set up and the largest of them was to be the Imperial Bureau of Animal Health. These Bureaux were to be located at important research institutes and the directors of institutes were to be the Directors of the Bureaux, but the actual work of the Bureaux was to be in charge of the Deputy Directors. The Bureau opened in October, 1929, when Mr. W. A. Pool joined as Deputy Director.

This Conference was convened largely to provide an opportunity to review the work and scope of the Bureau, and to ascertain how it can serve those for whom it was inaugurated. At the same time certain outstanding subjects of common interest to the different territories of the British Commonwealth of Nations were discussed in order to gather the experience of the leaders of veterinary science in the Empire.

During one day of the Conference, Tuesday, August 16th, the meeting was held at the Veterinary Laboratory, Ministry of Agriculture, Weybridge, in order to give the delegates an opportunity to inspect the Imperial Bureau of Animal Health and to see the work of the Veterinary Laboratory.

The Conference was opened by Mr. F. L. McDougall, past chairman of the Council of Imperial Agricultural Bureaux, who referred to the importance of animal industry which in the different countries supplies from 50 to 70 per cent. of the total wealth produced on all the agricultural lands of the Empire.

Important discussions took place on foot-and-mouth disease, caseous lymphadenitis of sheep, virus diseases of animals in general, laryngo-tracheitis, infectious bronchitis and coryza in poultry, blowflies of sheep, fowl paralysis, bovine mastitis, Johne's disease and chronic bovine haematuria.

At the discussion on the work of the Bureau, appreciation was expressed of the assistance it had given to the workers in the fields of veterinary research, public health, etc. The Conference recorded its emphatic opinion of "the extremely important place which this Bureau was filling in the conduct of veterinary research in the countries of the British Commonwealth" and recommended an extension of its activities on its present lines.

Some details concerning the Conference are given elsewhere in this issue.

CLINICAL COMMUNICATION

Intra-Articular Therapy in a Case of Osteo-Arthritis

F. G. WADDINGTON, B.V.Sc., M.R.C.V.S.
STANDISH, LANCS.

Subject.—A seven years' old bull mastiff bitch.

History.—Two years ago this bitch sustained a fracture of the lower part of the right femur, involving the outer condyle. This fracture was treated on orthodox lines, and a good union resulted, the bitch using the limb quite well. A few months later the bitch began to show intermittent attacks of lameness in the right hind leg. This was diagnosed as "rheumatism" of the joint which had been injured when the condyle of the femur was fractured. Salicylates were given when the attacks were evident.

These attacks of "rheumatism" occurred from time to time, until approximately January last, when it was noticed that the lameness was becoming permanent. It varied in degree, but the animal was now continuously lame.

On examination at this time, it was noticed that a definite "creaking" or "grating" sound was produced when the right stifle joint was flexed and extended. This operation caused the animal considerable pain. It was evident that some erosion of the cartilaginous articular surfaces had taken place. Around the margin of the joint, a number of nodular "osteophytes" were easily palpable.

Diagnosis.—Osteo-arthritis of the stifle joint, probably occurring as a sequel to the fracture

which involved the outer condyle of the femur.

Prognosis.—In view of the fact that the fracture was the probable cause of the condition and that organic changes had taken place in the joint, the prognosis was not good.

Further History and Treatment.—For a time the usual treatments were applied, without any real hope of success, such as rest, massage and counter-irritation. Sodium salicylate and novalgin (Bayer) were given internally. No permanent improvement was noticed. Novalgin, however, did relieve the pain temporarily, and when under the influence of this drug the bitch could walk tolerably well. It was not considered advisable to continue with this drug indefinitely, and after a fortnight or so it was discontinued. For about a month afterwards no further treatment was given, and the condition of the limb grew worse. The lameness increased, the bitch using the limb less and less; eventually she went about on three legs, only occasionally putting the affected leg to the ground. As a result there was considerable atrophy of the muscles of the right hind leg.

Another line of treatment was then tried, *i.e.*, that of "protein shock therapy." This was carried out by giving a series of injections of Yatren Vaccine E. 104 (Bayer) subcutaneously. At the same time the affected stifle joint was supported and the limb practically immobilised by means of an Elastoplast bandage. No improvement was noticed, and the bandage was removed after about three weeks.

For another three or four weeks, nothing more was done, and the dog's condition remained unchanged, except that the muscular atrophy increased. It was then decided to try the treatment recorded in an article in the March number of *The Practitioner*, pages 307-311.

The writer of this article, G. Laughton Scott, B.A., M.R.C.S., lately Senior Physician, London Neurological Clinic, had had a good percentage of satisfactory results in the treatment of osteo-arthritis in the human subject, by means of the intra-articular injection of various essential oils of the eucalyptol type, incorporated in an oily vehicle. For example, in osteo-arthritis of the knee joint, in subjects under 70 years of age, out of 50 cases treated the results of 36 were classed as good, twelve fair and two negative.

One particular preparation was found to be most constantly successful, and it was decided to use this one for the bitch. The mixture being:

℞ Camphor 5 per cent.
Oil of niaouli 20 per cent.
Ether 2 per cent.
Olive oil *ad* 100 per cent.

The optimum dose recommended for injection into the human knee joint was 0·1 c.c., to be repeated at intervals several times if necessary. No fixed intervals and no fixed number of injections are given. The number of injections and the intervals of time between them are apparently left to the discretion of the practitioner, according to the progress of the case. It was decided to give a somewhat larger dose than the above to the bitch. The hair was shaved from the anterior and outer aspect of the stifle joint and the skin was sterilised with iodine. The stifle was held in a semi-flexed position, and a fine hypodermic needle was introduced through the joint capsule, a little to the outer side of the ligamentum patellae. A little synovial fluid escaped through the needle, showing that the joint cavity had been reached. The charged barrel of the syringe was fitted to the needle and 0·5 c.c. of the above preparation was injected into the joint. The needle was withdrawn and the puncture dressed with iodine. This injection was given on May 11th, 1938. Within a few hours a vigorous reaction had developed. The region of the stifle joint was swollen and tender to the touch, and the joint capsule was distended. The bitch was rather distressed, she was disinclined to move, and lost her appetite for a day or two. Novalgin was given three times daily to relieve the pain.

This vigorous reaction remained at its peak for about two days and then began to subside gradually. In a fortnight the swelling had practically disappeared and the tenderness on palpation had gone. When the joint was manipulated it did not cause the bitch any pain, and the "creaking" sound was no longer evident. The joint, however, seemed rather stiff, though painless, and the bitch still did not use the limb.

As the reaction from the injection had been so severe, it was decided not to give a second dose for the time being, and to await events for a while longer. The owners were advised to massage the atrophied muscles daily and to make the bitch use the limb if possible. To encourage her to put her weight on the leg, a splint was applied on its inner aspect, and the limb was fixed in such a position that the foot rested firmly on the ground when the animal stood squarely. This splint was removed after about ten days. From then onwards the bitch began to use the leg more, and the atrophied muscles gradually increased in bulk. When seen on June 24th she was using the leg quite well, except that every now and then she would give one or two short hops on it, if she was made to hurry or if she was getting a little tired.

The owners then went on their holidays, and took the patient with them. They were advised to let her swim in the sea every day to help to get rid of any remaining stiffness of the joint, and to complete the development of the atrophied muscles.

(*Concluded at foot of col.* 1, *page* 1114.)

ABSTRACTS

[**A Study of the Vaginal Content of Pregnant Bang-Infected Cows for the Presence of Brucella abortus.** Fitch, C. P., Boyo, W. L., and Bishop, Lucille M. (1938.) *J. Amer. vet. med. Ass.* **92.** 2. 171-175.]

This investigation was carried out to determine whether *Br. abortus* is present in the vaginal mucus of pregnant infected cows at any time prior to calving or abortion. Samples were obtained at regular intervals from 58 infected cows by inserting cotton wool swabs into the vagina in close proximity to the *os uteri*, and emulsions were inoculated into guinea-pigs. Forty-six of the cows gave birth to living full-time calves and, of 44 examined, *Br. abortus* was isolated from the foetal membranes of nine and from the colostrum of 34 (77 per cent.); twelve cows aborted and *Br. abortus* was found in the membranes, foetus and colostrum of eleven. Of a total of 440 examinations of swabs taken before calving or abortion from the vagina of the 58 reacting animals, only seven yielded *Br. abortus* and five of these were recovered from cows 24 to 48 hours before parturition when the uterine seal was broken. In only two cows was the organism isolated before this stage. These studies indicate that *Br. abortus* is not ordinarily found in the vagina of pregnant Bang-infected cows until very shortly before an abortion or a normal parturition.

S. J. E.

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[**I.—Infection with Br. abortus Treated with Prontosil.** Richardson, A. L. (1938.); **II.—Sulphanilamide in the Treatment of Undulant Fever.** Francis, A. E. (1938.) *Lancet.* **234.** 5974. 495-496.]

Case 1.—Male 46 years. History of intermittent fever for one week before undulant fever was diagnosed. Blood titre at the time of diagnosis was 1:500. Treatment: 0·3 gr. prontosil twice daily *per os* for 18 days and at the same time 5 c.c. of a 5 per cent. solution of prontosil was inoculated on each of four consecutive days. Symptoms disappeared and the temperature was steady at the normal level by the tenth day of treatment. About five weeks later a relapse occurred which immediately responded to a further course of treatment and no further relapses took place.

Case 2.—Man 63 years. History of undulant fever persisting for twelve weeks in spite of a variety of treatments. Then prontosil was tried and given three times daily *per os* and an intramuscular injection was administered on alternate days for six days. Rapid recovery resulted but a precautionary course of prontosil tablets was given for six weeks.

***Case* 3.—Woman** 46 years. History of intermittent fever for five weeks before undulant fever was diagnosed by blood culture and serological test. A CO_2 sensitive strain of *Br. abortus* was isolated in this case. An uninterrupted recovery followed the administration of six daily three gramme doses of sulphanilamide.

The following cases were also referred to:—

Case (*a*).—Man 33 years. History of intermittent fever diagnosed on the twelfth day as undulant fever. Sulphanilamide was given *per os* (7·5 grammes) every four hours for three days. Thereafter the temperature dropped to normal. Later there was a slight relapse but the patient recovered again without further treatment.

Case (*b*).—Man 35 years. History of five months' intermittent fever eventually diagnosed as undulant fever. Three intramuscular injections of prontosil were given at weekly intervals followed by oral administration of three tablets a day for two weeks. Temperature became normal after which there was a slight relapse followed by complete recovery.

Case (*c*).—Man 34 years. History of intermittent fever which was diagnosed as undulant fever after one month. Rapid recovery followed the administration of prontosil three times daily.

Case (*d*).—Man 28 years. Undulant fever diagnosed after two to three weeks of intermittent fever. Recovery followed the oral administration of one tablet of prontosil for three days.

E. J. P.

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[**The Treatment of Bovine Sterility.** (Trans. title.) Giacomini, A. (1937.) *Clin. vet. Milano.* **15.** 9. 575-580.]

Examinations of over 1,000 sterile cows revealed that 59 per cent. were suffering from a vaginitis or cervicitis or both. In such cases powdered sodium bicarbonate applied to the mucosa with a wad of cottonwool appeared to be the most effective treatment, 90 per cent. of cows so treated becoming fertile. It was

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This seemed to complete the recovery. When seen on July 16th the bitch was going quite sound on the limb, and the muscles were restored to their normal condition, being equal in bulk to those of the opposite hind leg.

In view of the facts that the lameness had developed slowly and had grown steadily worse, that there was a definite osteo-arthritis present and that there was no improvement for several months, I think that one is quite justified in giving the credit for the recovery to the intra-articular injection of the above preparation.

possible to isolate in every case a non-haemolytic streptococcus.

In cases of metritis, pyometra, etc., Lugol's solution of iodine followed by lavage of the uterus for ten consecutive days with a sodium bicarbonate solution gives satisfactory results. Prolan injections are of value for the treatment of hypertrophy of the uterus and in cases where there is an absence of heat without specific lesions in the reproductive organs. Persistent corpora lutea may be satisfactorily treated by enucleation but ovarian cysts are much more difficult to deal with and cannot always be removed.

A case of vaginal haematoma is recorded which was successfully operated upon.

J. A. N.

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[**A Case of Equine Brucellosis, with Sternum Fistula.** (Trans. title.) Lousse, A. (1937.) *Ann. Méd. Vét.* **82.** 10. 413-416.]

Cases of equine brucellosis have been described in many European countries, including France and U.S.A. The symptoms evinced are very often those commonly associated with rheumatism.

Poll-evil and fistulous withers often have a brucellar origin and Lousse describes a chronic fistula in another region, *viz.*, the sternum, due to *Br. abortus*. The patient was a five-year-old gelding with considerable swelling in the region of the sternum from the scaphoid area to the front of the chest, causing the animal to abduct both limbs during progression, and an agglutination test for *Br. abortus* antibodies in the serum gave a positive result at 1:400 and 1:800 using an antigen made up of a bacterial suspension in physiological saline [1,000,000 living bacteria per c.cm.].

Allergic tests using Dubois's and Thomsen's brucellin gave positive results at 48 hours.

J. G. M.

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[**A Case of Orchitis in a Bull.** (Trans. title.) Bareggi, G. (1937.) *Clin. vet. Milano.* **15.** 8. 477-483.]

Examination of a bull's testicle, 1,000 gr. in weight, showed that the tunica vaginalis was greatly enlarged. It was composed of non-vascular fibrous connective tissue with well-defined nodules scattered through it. These were made up of small lymphocytes, a few giant cells and a radiating mass of filaments at the centre which stained strongly with eosin. The glandular tissue of the testis showed degenerative changes. Tuberculous infection and the presence of *Br. abortus* were excluded and it was concluded that the lesion was primary actinomycosis of the testis.

J. A. N.

REPORT

[**New South Wales. Livestock Diseases Report.** Recording control work during the year ended June 30th, 1937. (Henry, M.) (Govt. Printer, Sydney.)]

The chief feature of the year was the invasion of New South Wales by ephemeral fever (three-day sickness) which spread southward from Queensland. The classical symptoms of fever, salivation, muscular weakness and lameness, lasting for 30 to 40 hours, were recorded, but in some cases affected cattle were unable to rise for 14 days, and return to normal lactation was often considerably delayed. Though the mortality was negligible the economic loss was severe owing to the difficulty in marketing store cattle, and the reduction of the milk yield in dairy herds by from 10 per cent. to 80 per cent. No control measures were adopted as it was considered they would be impracticable against a disease which spread so rapidly and appeared in localities miles apart at the same time. South of the 34th parallel of latitude the number of animals affected was very small, but it is suggested that this failure to spread in the South might have been due to the approaching autumn rendering conditions unsuitable for some unknown vector.

Six outbreaks of contagious bovine pleuropneumonia are recorded, and it is mentioned that the use of the complement fixation test in the control of this disease has been continued. Control measures in the case of Johne's disease consist of slaughter of affected animals and the testing of in-contacts with johnin. Fifty-nine outbreaks of anthrax—the highest number yet recorded—occurred during the year, vaccination of over 375,000 animals being undertaken. A tubercle-free herd and area scheme is in operation, and tick eradication by fortnightly dipping is adopted to control piroplasmosis. Bovine actinomycosis is controlled by slaughter of affected animals. The year was a very satisfactory one as regards helminth parasites of sheep and it is recorded that, as a field condition, chronic fluke disease has ceased to exist thanks to the widespread use of carbon tetrachloride and anti-snail operations.

Research is being undertaken into contagious mastitis of cattle, salmonella infections, bovine contagious abortion, nutritional anaemia of sheep, blowfly, toxaemic jaundice of sheep, poultry diseases and ictero-haemoglobinuria of calves, against which *Cl. welchii*, type A, antiserum has been found to give protection.

U. F. R.

REVIEW

[**Science for the Citizen.** By L. Hogben. Published by George Allen and Unwin, Ltd. Price 12s. 6d. net.]

During the last few years there has been a growing demand for books written about science but written in such a way that they are intelligible to and understandable by the layman. This demand has led to a host of books written upon various branches of science and a few deal with most of them collectively. Hitherto, however, none has been written from the angle of " Science for the Citizen " in which the author has based a review of many important branches of our knowledge upon the social background of scientific discovery. This treatment has allowed him to develop his themes untrammelled by the necessity for keeping one set of facts in a section labelled physics or another in a section labelled biology. As a result, the work takes on a unique character which could have been reflected in a sub-title of " the evolution of science."

The book is divided into five parts, namely, the conquest of time reckoning and space measurement, the conquest of substitutes, the conquest of power, the conquest of hunger and disease and the conquest of behaviour.

The whole work is replete with interest and the themes are well thought out as is early shown by the easy use of primitive human monuments such as the Pyramids, Stonehenge, obelisks and others to illustrate man's effort to measure time, a necessity urged upon him by his early pastoral and grain economy. A widely different story which is dealt with equally well is the development of wireless telegraphy. But to the biologist the later sections of the book are perhaps of greatest interest and here Professor Hogben continues to survey the subjects with that easy marshalling of important facts shown so clearly from the beginning of the book.

Again, unlike most books of science, the work has a personal flavour as the author not infrequently introduces a sentence or two regretting that greater use of this or that piece of knowledge has not hitherto been made by the human race. As he states in the middle of the book, " Science advances most rapidly when its benefits are keenly recognised because they are most widely shared, especially when it brings new prosperity to a previously unprivileged class." Possibly this sentence reflects the true driving force which has enabled the author to complete his huge task. A second personal note is introduced by the excellent illustrations throughout by J. F. Horrabin.

In conclusion, it is wise to add a word of warning. The book is eminently readable but in the opinion of the reviewer it is not a book which can be read like a novel. It may become a " best seller," as in fact it deserves to be, but it is worthy of more serious treatment and demands many sittings of keen concentration. Such sittings, however, will be well repaid.

N.V.M.A. DIVISIONAL REPORTS

Western Counties Veterinary Association*

ANNUAL MEETING AT EXETER

The 54th Annual General Meeting of the above Division was held at the Rougemont Hotel, Exeter, on Wednesday, March 30th, at 2 p.m.

The President, P. W. Bloye, Esq., occupied the Chair and the following members signed the attendance book: Miss Hutton, Messrs. Bloye, Hall, R. E. L. Penhale, C. R. Parsons, R. H. Smythe, L. E. Perkins, G. Atkinson, L. Norman, J. K. Irvine, H. Macdonald, H. M. Webb, C. V. Watkins, C. Masson, H. B. Kauntze, W. Barbour, E. G. Conisbee, H. C. Wilkins, A. Mather, T. H. Irwin, J. C. Dyson, P. Fisher, H. Fraser, R. G. Saunders, R. B. Nelder, H. W. Townson, W. H. James, E. J. Thorburn, H. G. L. Harvey, W. L. Richardson, W. G. Blackwell and S. J. Motton. Dr. J. T. Edwards and Messrs. Rutherford, R. Hart, P. G. Steel and H. Streeter were present as visitors.

Apologies for absence were received from Sir F. Hobday, Major Dunkin, Major Ascott, and Messrs. Chase, C. Crowhurst, A. G. Saunders, P. Penhale, C. Stephens, E. R. Edwards and Head and Head, Helston.

The minutes of the previous meeting, having been published in the *Veterinary Record*, were taken as read.

New Members.—Captain G. Atkinson and Captain J. Fox, of the Ministry of Agriculture and Fisheries, were unanimously elected.

Reports.—The annual reports of the Hon. Treasurer and the Hon. Secretary were received and adopted.

Election of Officers

The following officers were elected for the ensuing year:—

President.—Mr. J. K. Irvine.

Vice-Presidents.—Messrs. Bloye, Watkins, Fraser and R. H. Smythe.

Hon. Auditor.—Mr. E. R. Edwards.

Hon. Treasurer.—Mr. R. B. Nelder.

Hon. Secretary.—Mr. S. J. Motton.

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Council.—The President, Hon. Treasurer, Hon. Auditor, Hon. Secretary and Messrs. Norman, Masson and R. H. Smythe.

County Secretaries.—Dorset, Major Fyrth; Somerset, Major A. G. Saunders; Devon, Mr. R. B. Nelder; Cornwall, Mr. S. J. Motton.

Representatives on N.V.M.A. Council.—Messrs. Nelder, R. H. Smythe and S. J. Motton.

Scale of Fees.—It was agreed that the scale of fees for the clinical examination of cows under the Milk and Dairies Order should be that of the Ministry of Agriculture and Fisheries, namely, up to 25, 21s. and after that at the rate of 6d. per head plus the Ministry's scale of mileage.

Next Meeting.—It was decided to hold the June meeting of the Division at Launceston.

Address.—Dr. J. T. Edwards gave an address [to be published in a later issue of the *Record*] on "The Probable Significance of Some Nutritional Factors in Relation to the Common Unsoundnesses in Horses."

At the conclusion of the meeting the President proposed a very hearty vote of thanks to Dr. Edwards for his very excellent address and this was carried with acclamation.

S. J. Motton, *Hon. Secretary.*

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Sussex Veterinary Society*

MEETING AT BRIGHTON

A meeting of the Sussex Veterinary Society was held at the Old Ship Hotel, Brighton, on April 29th, 1938, with the President, Mr. H. Scott Dunn, in the Chair.

There were also present Messrs. L. S. Balls, S. E. B. Balfour-Jones, W. P. Blount (Hon. Secretary), J. B. Dier, J. J. Edgar, John Edwardson, S. Gourley, S. E. Holmes, L. Jordan, H. N. Kellas, H. Kirk, J. W. R. Pearce, J. W. Pritchard, R. Renfrew, Sam Smith, Miss M. L. Somervail, Messrs. F. B. O. Taylor, H. Taylor, A. L. Walther and Miss D. Williams.

Messrs. F. Chambers, H. S. Gates, F. C. Gillard, E. W. Goodall, G. H. K. Peace, G. J. W. Moon and Miss W. M. Brancker attended as visitors.

The minutes of the last meeting, held on February 4th, 1938, have not yet been published in the *Veterinary Record*, although the material is in the hands of the printers. The Secretary informed the meeting that he had seen a copy and they were all in order. The minutes were taken as read.

Correspondence.—(1) Letters of apologies for absence were received from Messrs. A. J. Alexander, G. W. Begg, R. E. Beilby, T. Bolton, E. Clark, C. Crompton, T. Dalling, J. Fox, Sir Frederick Hobday, G. S. Peyton, A. Spicer, J. F. D. Tutt and F. W. Willett.

The resignation of Mr. J. Fox was accepted with reget.

(2) A letter from the Secretary of the N.V.M.A. with reference to representatives of this Society on the Council was read and it was decided to nominate members at the next Council meeting of the Society.

(3) A letter from Messrs. Buxton and Simpson *re* the International Congress drew a good deal of discussion, and it was decided to leave the matter over until the next meeting of the Society, and in the meantime, to find out what other societies were doing.

A resolution by Major Hamilton Kirk that in any event the subscription should be limited to two guineas was carried unanimously.

Nominations.—The following veterinary surgeons were nominated for membership: Miss Mary Brancker, Mr. Eric Goodall and Mr. G. H. K. Peace.

Refresher Poultry Course.—The Secretary then read a letter from the Secretary, N.V.M.A., *re* suggested refresher poultry course for veterinary surgeons, and also a letter from Mr. R. H. B. Jesse, Director of Agriculture, East Sussex County Council, expressing his Committee's willingness to provide for such a course at the School of Agriculture, Plumpton.

Mr. Blount said that as the course would cover not only disease and its prevention, but poultry management, the management side would be dealt with by the County Poultry Instructor, and the feeding side probably by the Director of Agriculture, whilst he himself would be responsible for the disease aspect.

Mr. Scott-Dunn asked at what time the lectures would be given, and Mr. Blount said they could be given at times to suit all practitioners.

R.S.P.C.A. Free Clinics.—Mr. Gourley proposed that the general principles of the scheme be accepted, and this was carried with one dissentient.

Paper.—Major Frank Chambers, O.B.E., F.R.C.V.S., then gave a paper entitled "Clinical Manifestations of Brucellosis Associated with Farm Stock." [This paper is reproduced, together with a report of the discussion upon it and the essayist's reply to the questions raised, earlier in this issue.—*Editor.*]

Mr. Scott-Dunn thanked Major Chambers for his excellent paper and, on his call, the meeting accorded a hearty vote of thanks to him, Major Chambers making suitable response.

The Secretary then read an article appearing in *The Evening Argus*, of April 27th, with reference to foot-and-mouth disease.

Captain Balls proposed that the paper should be sent to Dr. Bullock to deal with, and this was seconded by Mr. Edgar and agreed.

W. P. Blount, *Hon. Secretary.*

*Received for publication July 8th, 1938.

IMPERIAL VETERINARY CONFERENCE

GENERAL ACCOUNT OF PROCEEDINGS

In our editorial columns we refer to the Imperial Veterinary Conference which, as recorded in our issue of last week, was held at the Royal Veterinary College, London, through the courtesy of the Principal, Professor J. Basil Buxton, on August 15th, 17th and 18th, and at the Imperial Bureau of Animal Health, Veterinary Laboratory, New Haw, Weybridge, on August 16th.

The Conference was attended by delegates appointed by the different territories of the British Commonwealth of Nations, together with the heads of veterinary institutes in the United Kingdom and certain specialists invited to assist in the discussion on particular subjects. Those attending the Conference—a group photograph, with key, is reproduced herewith—were as follows:—

DELEGATES.

United Kingdom.—Mr. D. A. E. Cabot, Professor J. Russell Greig, Major G. W. Dunkin, Dr. V. E. Wilkins, Mr. H. G. Lamont, Dr. W. Horner Andrews and Dr. J. M. Hamill.

Canada.—Dr. E. A. Watson and Dr. T. W. M. Cameron.

Commonwealth of Australia.—Mr. Max Henry.

New Zealand.—Dr. C. S. M. Hopkirk and Lieut.-Colonel A. H. Reid.

Union of South Africa.—Dr. P. J. du Toit and Mr. R. A. Alexander.

Eire.—Mr. J. H. Norris and Mr. J. D. Whitty.

India.—Colonel Sir Arthur Olver, Mr. P. J. Kerr and Captain S. C. A. Datta.

Southern Rhodesia.—Captain C. F. Johnston.

Colonial Delegates.—Mr. R. Daubney, Mr. J. A. Griffiths, Mr. H. G. Stewart, Major H. R. C. Higgins, Mr. H. S. Purchase and Mr. R. A. B. Stanhope.

In addition the following were invited to attend the Conference or particular sessions of it: Dr. C. H. Andrewes, Sir Joseph Arkwright, Mr. L. E. W. Bevan, Captain Vincent Boyle, Professor J. Basil Buxton, Professor J. F. Craig, Professor T. Dalling, Mr. N. Dobson, Mr. K. D. Downham, Mr. T. M. Doyle, Mr. S. J. Edwards, Dr. A. H. H. Fraser, Mr. R. E. Glover, Mr. R. F. Gordon, Mr. L. B. A. Grace, Dr. J. Hammond, Dr. R. P. Hobson, Professor H. D. Kay, Sir Patrick P. Laidlaw, Mr. E. C. Lloyd, Dr. R. Lovell, Sir Thomas H. Middleton, Professor F. C. Minett, Mr. W. Moore, Mr. E. G. Morris, Sir John B. Orr, Major D. S. Rabagliati, Dr. I. Clunies Ross, Professor F. W. Schofield, Captain R. Simpson, Mr. John Smith, Dr. A. W. Stableforth, Mr. E. L. Taylor, Professor D. M. S. Watson, Mr. J. E. Wilson and Lieut.-Colonel T. Dunlop Young.

Following are the names of the Executive Council of the Imperial Agricultural Bureaux responsible for calling to Conference, the Secretary of which was Mr. W. A. Pool, M.R.C.V.S., of the Imperial Bureau of Animal Health: Nevill L. Wright, F.I.C., D.I.C. (Chairman), New Zealand; Lieut.-Colonel George P. Vanier, D.S.O., M.C. (Vice-Chairman), Canada; Sir Donald Fergusson, K.C.B., United Kingdom; F. L. McDougall, C.M.G., Australia; F. J. du Toit, Union of South Africa; J. M. Adams, F.R.C.Sc.(I.), Eire; D. James Davies, C.B.E., Newfoundland; Shamaldhari Lal, I.C.S., India; B. F. Wright, Southern Rhodesia; J. A. Calder, Colonies, Protectorates and Mandated Territories, and Sir David Chadwick, K.C.M.G., C.S.I., C.I.E., Secretary.

After the opening ceremony, which was performed by Mr. F. L. McDougall, Past Chairman of the Council of the Imperial Bureaux, the Conference settled down to a busy four days' work.

At its first session on August 15th the Conference discussed the work of the Imperial Bureau of Animal Health. As a result of later discussions in committee, the Conference recorded its emphatic opinion "of the extremely important place which this bureau now fills in the conduct of veterinary research in the countries of the British Commonwealth" and recommended an extension of its activities on its present lines.

Disease Discussions

At its opening session in the afternoon the Conference considered *Foot-and-Mouth Disease*, the chair for this session being taken by Professor Buxton. Mr. D. A. E. Cabot (United Kingdom) stated that a serious wave of this disease was passing over the Continent and that, although Great Britain was relatively free, strenuous measures were necessary to prevent its introduction from abroad. In Germany alone no less than 300,000 outbreaks had occurred this year, as against only 157 in Great Britain.

Concerning the manner in which the foot-and-mouth disease virus is introduced into this country, Mr. Cabot stated that the current regulations were sufficiently stringent to prevent the introduction of the disease by means of imported live animals and that considerable controversy had therefore taken place as to how these repeated invasions had occurred. Definite light was thrown on the subject in 1926 when an outbreak in Scotland was traced to diseased pig carcases imported from the Continent and found in a bacon factory. The drainage in this factory flowed into the town sewage and thence, after passing through a septic tank, on to a field where cattle were grazing. As a result of this discovery an embargo was placed on the importation of meat (except preserved meat) from the Continent. This embargo was still in force.

At the same time the trade in meat in certain other countries was reviewed and the Governments of the South American Republics agreed to adopt measures that would afford security to the United Kingdom. One Republic in particular received a mission from the United

IMPERIAL VETERINARY CONFERENCE 1938

Langfier, 343, Finchley Road, N.W.3.

Left to right

Dr. J. Hammond, U.K. — Sir David Chadwick, I.A.B. — Dr. I. Clunies Ross, Australia. — Mr. J. A. Griffiths, Nigeria. — Dr. R. Lovell, U.K. — Mr. R. A. Alexander, Union of South Africa. — Mr. H. G. Lamont, Northern Ireland. — M. R. A. B. Stanhope, Malaya.

Mr. T. M. Doyle, U.K. — Mr. W. Moore, U.K.

Prof. F. C. Minett, U.K. — Prof. H. D. Kay, U.K. — Sir Patrick Laidlaw, U.K. — Maj. G. Dunkin, U.K. — Mr. S. C. A. Datta, India. — Mr. H. G. Stewart, Uganda. — Maj. H. R. C. Higgins, Tanganyika Territory. — Dr. A. W. Stableforth, U.K.

Mr. P. J. Kerr, India. — Dr. R. Hobson, U.K. — Mr. J. D. Whitty, Eire. — Mr. L. E. W. Bevan, Southern Rhodesia. — Mr. H. S. Purchase, Northern Rhodesia.

Mr. W. A. Pool, I.B.A.H. — Dr. C. S. M. Hopkirk, New Zealand. — Capt. C. F. Johnston, Southern Rhodesia. — Dr. E. A. Watson, Canada. — Dr. W. Horner Andrews, U.K. — Prof. J. B. Buxton, U.K. — Mr. F. L. McDougall, Australia, (I.A.B) — Mr. D. A. E. Cabot, U.K.

Mr. Max Henry, Australia. — Mr. J. H. Norris, Eire. — Col. Sir Arthur Olver, India. — Dr. P. J. Du Toit, Union of South Africa. — Mr. R. Daubney, Kenya Colony.

Kingdom, as a result of which it agreed to increase its veterinary staff and to adopt certain precautionary measures with regard to meat slaughtered for export to this country.

After describing precautionary measures taken in this country with regard to, among other things, the importation of goods packed in hay or straw, the compulsory boiling of kitchen refuse fed to pigs and the disposal of hessian used for wrapping carcases, Mr. Cabot proceeded to consider the theory that starlings play a part in the introduction of the virus from Continental countries. This theory had been discussed as long ago as 1921 by Stockman and Miss Garnett but no substantial evidence was received until the extensive series of outbreaks that occurred between November 16th, 1937 and March 9th, 1938. These outbreaks occurred largely in the coastal counties from Lincoln to Dorset and in the adjacent counties inland. This series of outbreaks presented several remarkable featurs, in that (1) the outbreaks rarely spread from farm to farm, (2) they occurred simultaneously in farms several miles apart, (3) fresh outbreaks occurred in areas where the disease had recently been suppressed. The inference was that these counties were being subjected to repeated invasions from abroad.

It was known, continued Mr. Cabot, that starlings arrive in this country by two main routes. North of the Wash and Humber they came from Scandinavia, which last autumn was free from foot-and-mouth disease, while to the South and as far west as Dorset they came from the Low Countries, Germany and France, where, during the starlings migratory period, foot-and-mouth disease had been at the peak of its incidence. It was also reported that numbers of recently arrived starlings had been seen on or near infected farms. On the virus from this series of outbreaks being supplied to the Pirbright Experimental Station for typing, it was discovered that the virus was in nearly all cases of the same type as that of the Continental epizootic. Owing to this set of circumstances the theory that starlings act as mechanical carriers of foot-and-mouth disease had been considerably strengthened.

Later speakers discussed the advisability of attempting active immunisation of stock against foot-and-mouth disease and emphasised the dangers of this method of attack in countries that were as yet comparatively free from the disease.

The subject of immunisation was also discussed on Tuesday when *The Virus Diseases of Animals* was the subject of a session of which Dr. C. S. M. Hopkirk (New Zealand) was Chairman. Several speakers emphasised the fact that in areas where any particular virus disease, such as foot-and-mouth disease or rinderpest, was limited in distribution immunisation was a positive danger in that it tended to establish the disease and to cause possible foci of further outbreaks. Immunisation, however, played a useful part in countries where a virus disease was so firmly implanted that there was little likelihood of stamping it out by slaughter or quarantine. Dr. E. A. Watson (Canada) who opened the discussion and many of the subsequent speakers emphasised the paucity of our knowledge of the nature of viruses and urged the need for further research.

Opening the discussion on *Caseous Lymphadenitis of Sheep*, Lt.-Col. A. H. Reid, O.B.E. (New Zealand), said that it was difficult to induce stock owners to take much interest in this disease as it does not kill the animal and because the disease often escapes detection at the hands of the meat inspector. Mr. Max Henry (Australia) said that caseous lyphadenitis was comparatively prevalent in Australia and was being spread by the use of machine shearing. Mr. Henry stated that this disease had only become of economic importance to Australia owing to the fact that the British authorities rejected carcases showing caseous lesions. He wished to know if this severity in rejecting such carcases was necessary and whether there is any evidence that the disease is transferable to man or whether it is transferable to other animals from imported carcases. Mr. Hopkirk (New Zealand) supported Mr. Max Henry and stated that the change over from palpation to the incision of glands by the New Zealand Meat Inspection Service had cost the Dominion about £30,000 per annum. Lt.-Col. Dunlop Young, O.B.E., stated that Great Britain could import all the healthy carcases she needed. A caseous lesion might not produce any ill effects on the consumer yet it was in any case an unpleasant sight, from which the consumer had a right to be protected. The Smithfield authorities, said Lt.-Col. Young, had only begun to realise how prevalent this disease was in imported carcases since the war, when it became the practice for butchers to buy their meat in the form of small joints instead of whole carcases. The carving up of the carcases at Smithfield had revealed lesions in meat that was otherwise prime. The United Kingdom had in any case afforded a considerable saving to the mutton exporting countries by deciding that only the affected joint or cut should be rejected and not the whole carcase.

Two important poultry diseases were discussed at the Conference and it was emphasised by several speakers that the poultry industry was one of growing importance and one to which veterinarians should devote more of their attention.

Mr. N. Dobson stated that the poultry industry in this country was valued at £30,000,000 per annum and was the third most important branch of agriculture. *Laryngotracheitis*, the first poultry disease to be discussed (with Mr. R. Daubney, O.B.E., Kenya, in the Chair) had, said Mr. Dobson, been first proved in this country in 1935, when it occurred in a large packing plant in Norfolk. Mr. Max Henry said that laryngotracheitis was also a brand new disease in Australia and one of growing importance to the industry. In Canada, however, according to Professor F. W. Schofield, the disease was first diagnosed in 1921 and is now quite common in Ontario. *Fowl Paralysis* was discussed at a later session, at which Mr. Max Henry took the chair. This disease, said Professor T. Dalling, who opened the discussion, was one of the chief causes of fowl mortality at present. As with laryngotracheitis, the etiology of the disease was very obscure. There were at present three theories as to its causation: (1) that it was a filtrable virus, (2) that it was neoplastic in origin, (3) that it was of an infectious nature. Dr. A. H. H. Fraser, of the Rowett Research Institute, Aberdeen, supported later by Sir John Orr, said that he favoured the infection theory, largely because of the sudden and explosive nature of the outbreak of the disease that had recently decimated the flock at the Rowett Institute. Subsequent experiment had tended to confirm this theory.

Discussing the *Blowflies of Sheep* (Chairman, Mr. J. H. Norris, Eire), Dr. I. Clunies Ross (Australia) said that this pest was public enemy No. 1 of the Australian livestock industry and caused losses amounting to £4,000,000 per annum. Blowflies, he said, only attack sheep that had been predisposed to strike by the wetting or soiling of the skin, and the disease was thus commonest in ewes and ewe lambs. A faulty breeding policy by promoting skin folds in the belief that these folds promoted heavier fleeces had in the past tended to predispose sheep to strike. Actually these folds acted as traps for moisture and dirt and so attracted the blowfly. There was evidence of a tendency to get away from these heavily folded types and to breed for plainness. Dr. Clunies Ross strongly advocated the use of fly traps, if possible one trap to every 10 or 20 acres, to keep down the blowfly population, and also the destruction of dead carcases. Both these methods had been tried with evidence of success. Mr. Max Henry and Dr. P. J. du Toit (South Africa) supported the use of fly traps and carcase destruction, while Dr. du Toit described how fly traps had been used with a great measure of success in certain parts of Africa against the tse-tse fly.

The subject of *Bovine Mastitis* was introduced by Dr. Hopkirk, with Dr. du Toit in the chair. This disease, said Dr. Hopkirk, was of world-wide economic importance. The majority of herds in New Zealand were affected and the loss ran into the neighbourhood of £3,000,000 per annum. Milking machines were, in his opinion, apt to produce mastitis, especially when the pressure was kept too high. Professor H. D. Kay, O.B.E., stated that the loss from mastitis was not confined to a loss of milk by the farmer but that there was also a deterioration of the milk supply to the consumer, especially as far as dairy products such as cheese were concerned. Milk from a cow suffering from mastitis had been proved to affect the body and texture of cheese made from it—a fact subsequently borne out by Dr. Hopkirk from New Zealand experience.

Another discussion was concerned with *Johne's Disease* (Chairman, Mr. D. A. E. Cabot), during the course of which Major G. W. Dunkin gave an account of the development of johnin as a diagnostic agent and Dr. Hopkirk described the methods that had been applied in New Zealand to eradicate or control this disease.

The final session dealing with a specific disease was held on Thursday morning with Col. Sir Arthur Olver as Chairman, when Captain S. C. A. Datta gave an account of his recent researches into the causes of chronic *Bovine Haematuria* in India. Other speakers described the conditions under which this disease occurs in their countries and the various theories which had been propounded as to its origin.

Future of the Conference

Mr. F. J. du Toit, the representative of South Africa on the Executive Council of the Imperial Agricultural Bureaux, was in the Chair at the closing meeting. In his speech terminating the Conference he took special note of a resolution of the Conference that similar meetings should be held in future when the International Veterinary Congress is due to be held in Europe or the British Empire. This, he said, was the first Imperial Veterinary Conference ever held and it had proved useful for the interchange of information and discussion of common problems.

His Majesty's Government in the United Kingdom was pleased to give a dinner on the occasion of the Conference on the evening of Wednesday, August 17th, and the Executive Council, Imperial Agricultural Bureaux, entertained the Conference when it visited Weybridge on the 16th instant.

It is anticipated that the printed report of the Conference will be issued within a few weeks.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Sept. 5th-9th.—Annual Congress, N.V.M.A., at Glasgow.

Sept. 5th.—Meeting of the Society of Veterinary Practitioners, at Glasgow.

Sept. 8th.—Annual Dinner of the Royal (Dick) Veterinary College Alumnus Association at the Ca'dora Hotel, Glasgow, 6.45 p.m.

Sept. 19th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

Sept. 20th.—Applications due for Miss Aleen Cust Veterinary Research Scholarship.
R.C.V.S. Examination Committee Special Meeting.

Oct. 5th.—R.C.V.S. Committee Meetings.

Oct. 6th.—R.C.V.S. Committee Meetings.

Oct. 7th.—R.C.V.S. Committee and Council Meetings.

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GLASGOW CONGRESS

All members of the Association should now be in possession of copies of the Congress Handbook and Papers, which were circulated early last week. If any member should have failed to receive these, duplicates will be supplied upon application.

It is regretted that the names of Major Peter McIntyre, Professor William Robb, Captain James F. Taylor and Mr. W. L. Weipers did not appear in the list of members of the Provisional Committee published in page 6 of the Handbook. This omission is singularly unfortunate in view of the great help given by these members in arranging the Congress and it is desired to correct the oversight in the only way possible at this stage.

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As we desire to stress their importance to those of our readers who are attending Congress, we reproduce the following notes from the N.V.M.A. Congress Handbook (pp. 10 and 25) and intimate that they will be displayed on the Congress notice board:—

Local Secretary's Offices

The Local Secretary will have two offices. One will be at the Central Station Hotel (open on Sunday evening from 7.30 p.m., and on Monday, Tuesday, Wednesday and Thursday, from 9 a.m.); the other in the Concert Hall of the Empire Exhibition (open from 10.15 a.m. on Monday for the remainder of the Congress).

Empire Exhibition

Tickets enabling members and delegates to obtain admission to the Empire Exhibition at the reduced charge can only be obtained at the Local Secretary's office at the Central Station Hotel.

Situation of Conference Room and Exhibition

Members and delegates are requested to note that the entrance to the Exhibition in Bellahouston Drive is the one most convenient for the Concert Hall. The Exhibition can be reached by: (1) Bus or tram *via* Paisley Road; (2) Train from Glasgow Central Station to Ibrox; (3) Underground to Cessnock and then by tram.

The Cruise

For those who might find it inconvenient to join the steamer at George V Bridge Walk at 10 a.m., it will be possible to leave Glasgow Central Station at 11.6 a.m. and join the steamer at Gourock at 12 noon. The steamer will make a call again at Gourock about 4 p.m. Train fare in addition to cruise: first class return, 3s. 4d.; third, 2s. Ticket to be obtained at L.M.S. Booking Office, Central Station.

Golf

The competitions for the Simpson and Dunkin Golf Trophies, in aid of the Victoria Veterinary Benevolent Fund, will be played on Wednesday, September 7th, at the Cathkin Braes Golf Club, and Haggs Castle Golf Club, respectively, by courtesy of the clubs (*see* programme).

Both contests will be in the form of a medal round of the course, each competitor playing from his or her lowest handicap. The winner of the Simpson Cup will receive a medal, while the runner-up will receive a spoon, presented by the Congress Committee and Captain Simpson, respectively.

Intending competitors are requested to write to Dr. W. S. Gordon, Moredun Institute, Gilmerton, Midlothian, the acting Secretary for the competitions.

Parking of Cars

Empire Exhibition.—There are several Parking Places near the Concert Hall.

Civic Reception.—Cars may be parked in Ingram Street, Montrose Street and Royal Exchange Square.

Social Functions in the Central Station Hotel.—There is parking room for about 30 cars at Platform 13 in the Central Station. Cars may also be left in Royal Exchange Square, at the S.M.T. Garage, Waterloo Street, and Prosser's Garage, West Campbell Street.

Veterinary Benevolent Dance (Ca'dora Restaurant).—The S.M.T. Garage, Waterloo Street, Prosser's Garage, West Campbell Street, and Royal Exchange Square are the most convenient.

In connection with the announcement made in our Diary of Events, of the holding of the annual dinner of the Royal (Dick) Veterinary College Alumnus Association at the Ca'dora Hotel, Glasgow, on **Thursday, September 8th,** at 6.45 p.m., the attention of intending participants is drawn to the fact, which is much regretted, that in the Congress Handbook this event is erroneously given as taking place on the evening of Friday, September 9th.

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THIRTEENTH INTERNATIONAL VETERINARY CONGRESS

More than 30 nations were represented by 2,000 delegates at the Thirteenth International Veterinary Congress which, with a strong British representation and under the Presidency of Professor E. Leclainche, opened at Zurich on Sunday last, the Conference being completed at Interlaken on August 26th and 27th.

At the opening meeting on the Sunday, addresses were given by the President of International Veterinary Congresses (Professor Leclainche), the President of the Organising Committee (Dr. G. Flückiger) and by the Representative of Government of the Canton of Zurich, welcoming the Congress. The report of the General Secretary to the Permanent Committee (Dr. L. de Blieck) was received and, following elections to membership of the Congresses, addresses by official delegates brought the session to a close.

On the following day (Monday, August 22nd) a commencement was made on the long and varied programme, affording experts of all countries the opportunity of exchanging their experiences and reporting the progress made in recent studies of the diseases of animals. While in due course we hope to deal extensively with the proceedings of this outstandingly important conference, in this number—writing while the Congress is still in its early stages—we report the presentation of certain papers to the General Section, as follows.

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Veterinary Education Under Modern Requirements

Professor E. Leclainche (Paris), opening the programme of papers on the Monday morning, in dealing with the above subject said that a careful selection of students is the best guarantee for the future of our profession; it is essential that the present high standard of the diploma examinations following secondary school studies be maintained.

The programme of teaching must comprise everything that concerns production, care and utilisation of animals. Hygiene and preventive and curative medicine form a complex that cannot be dissociated. The science of breeding is nothing but hygiene put into practice and it is essential to our programme of studies.

The programmes of school teaching, theoretical or practical, must continuously be adapted to the variable importance of the various aims of professional practice. They must be completed in various stages of application, introducing the practitioner to rural life, to the practices of breeding, to professional experience in the field of medicine and meat inspection.

Post-school instruction and its extension to all practitioners must be given full attention.

The Veterinarian in Animal Husbandry and Food Production

Professor V. Stang (Berlin) followed, with a paper on "The Importance of the Veterinarian in Animal Husbandry and in the Production of Food Products of Animal Origin." The activity of the veterinarian, he said, is often supposed to be limited to the treatment of sick animals. In reality, it embraces a much more varied and more extensive domain. Each State has enacted laws regulating veterinary police, meat inspection, supervision of food commodity markets, the protection of animals, the destruction of carcases and the breeding of animals. The veterinarian must collaborate in the interpretation and application of these laws.

To maintain the national wealth and assure food for the nation, the State encourages the breeding of animals through mediate and immediate measures, protects the herds from epidemics and organises the battle against these. The determined action of the veterinarian has brought about the eradication of various epizoötics and has reduced others to a few outbreaks of little importance. This result demonstrates the importance of the veterinarian, more particularly because many of the diseases eradicated or controlled are transmissible to man.

The helpful influence of the veterinarian applies largely to breeding, the enhancing in value of the animals and consequently the production of food commodities.

We often admit, in our day, that sterility, tuberculosis, diseases of the udder and the ills of breeding are the consequence of weakened constitution. In Germany the veterinarian must safeguard the health of the herd and collaborate in the development of its breeding and its yield. From this professional knowledge the veterinarian is the person best qualified to direct breeding and to lead it into ever new channels. All unprejudiced persons should recognise the preponderant rôle of the veterinarian in the breeding and utilisation of animals.

The veterinarian is the guardian of human health; he inspects and supervises the food supplies of animal origin. This supervision is necessary. It prevents the consumption of meats of inferior quality or dangerous for man. This is why the slaughter of animals, the handling and the processing of meats into food articles are supervised and controlled by the veterinarian.

To insure the public health the inspection of meats, of food commodities offered for sale in markets, stalls, in restaurants, as well as other foods—deer, poultry, fish—in the large stores or in cold storage, should be completed by an authorised veterinarian. In numerous States such supervision is regulated by law.

Milk also can affect man and transmit to him, for example, tuberculosis, undulant fever and paratyphus. Only the veterinarian can recognise the presence of these diseases in the living animal; unfortunately, the control of milking stock by the veterinarian is not everywhere

compulsory. Numerous States have enacted ordinances covering the production of milk. The German milk law of 1930 embodies the principle: "that only a healthy animal can give healthy milk," and exacts a continuous veterinary supervision over milking stock. This method has given excellent results.

General Conditions Governing the Origin and Development of Infectious Diseases

The above subject was considered at the next General Meeting, on Wednesday last, when Professor W. Frei (Zurich), in his paper, observed that the phenomena of resistance and disposition are brought into relation with our knowledge of physiology and physiological chemistry. The general and local internal factors of resistance against infection and disease are investigated from this standpoint. Relations are found between resistance on one side and heredity, internal secretion, vegetative nervous system, irradiation and nutrition, especially hypovitaminosis on the other. Among the local conditions the oxydoreduction potential is a specially important factor governing the proliferation of obligatory aerobes and anaerobes. Further, *p*H, chemotaxis, reactions of blood vessels and their permeability, play a part.

Regarding control of infectious diseases, not only have the usual methods to be applied and arrangements for healthy surroundings created but the breeding of specially resistant families has to be tried.

Dr. P. J. du Toit (South Africa), who followed, said that infectious diseases have been of great economic importance in the past, and still play a great part in the economic life of the community.

These diseases may be introduced into a country in a variety of ways: an infected animal or infected material may be responsible; or the disease may be introduced by a "carrier."

The speaker discussed the question whether new infectious diseases can arise; showing how through differentiation, a single disease may in course of time, split into several separate diseases. Examples were quoted of apparently new diseases which have appeared for the first time in recent years.

The rate of distribution of infectious diseases may vary considerably. Some remain almost stationary. Those which are transmitted by contact spread at a fairly rapid rate. With modern means of transport, diseases may be carried over long distances. Wars have played an important part in the spread of diseases, many of which may be termed "war diseases." Non-infectious diseases, which are transmitted by arthropod vectors, may also spread over wide areas.

Many factors influence the spread of infectious diseases. The soil may be an important factor in some diseases. Rainfall, vegetation, temperature, and sunlight are very important factors in others. The nutrition of animals also has a great influence on the development of some diseases. Very important, too, is the density and distribution of the susceptible animal population and also the nature and the distribution of the reservoir of the disease. Factors connected with the infective agent may also have a profound influence on the spread of a disease, among which may be mentioned the virulence of an organism, its infectivity and the strains produced by it.

The various epizoötics present different features. Some sweep through a country like a fire. Others show a distinct periodicity; frequently the periods between successive outbreaks are of a few years' duration. Others again appear seasonally, depending on the heat or the rainfall. Epizoötic diseases may become enzoötic, in which case they usually alter their character.

Infectious diseases have been known to disappear spontaneously from a country. [Dr. du Toit indicated the manner in which this might come about.] However, the probability is that, before such a process could be operative, man will have eradicated most of the important epizoötic diseases.

It must be the aim of the veterinarian to acquit himself worthily in the great task he has to fulfil in the control and eradication of diseases.

Disturbances in Animal Reproduction

Professor R. Götze (Hannover), opening the discussion of this subject at the General Meeting on August 25th, said that it has been estimated that on German territory from one-fifth to two millions of animals are examined and treated every year by veterinarians for sterility or other ailments of reproduction. The fecundity of animals plays such an important rôle in the breeding of livestock and in public economy that one visualised the necessity for the creation of official organisations, encouraged by the State or by private initiative, which would be charged with the regular control of breeding establishments in order to disclose the ills of the functions of reproduction and to seek remedies.

Above all the cause should be sought in the influence of unfavourable surroundings. It is evident that there exist individual hereditary differences concerning general aptitude to fecundity as well as hereditary individual predisposition to morbidity, but they play a secondary part only.

The influence of surroundings manifests itself in four different directions: in the breeding, in the care and feeding, in the appearance of specific infectious diseases, and the appearance of sporadic diseases.

There must be kept in mind the more or less artificial conditions under which the breeding of domestic animals is carried out, lest diseases be thought to exist when they do not. Ills of breeding functions caused by faults in care and feeding and by specific infectious maladies play the greatest rôle and these must be avoided in the first place. Diversified feeding; farming methods looking not only to increased returns on fields and meadows but to improvement of the forage in assimilable properties, in mineral salts and vitamins; a judicious choice of fattening feed; keeping the pasturage in perfect condition—these are the best means of fighting the ills of breeding caused by irrational feeding methods or absence of hormones and vitamins. The last two groups of substances often do not suffice to bring about an improvement when administered by the clinician because present knowledge is inadequate to enable one to know which is at fault in a case of sterility.

Active prophylaxis represents the surest and most efficacious means of combating reproduction ills of infectious origin: progress in diagnosis, finding and eliminating suspect individuals and germ carriers, isolation measures, treatment of the sick and suspected animals, slaughter if necessary.

When faulty feeding and infectious diseases are not the cause, ills of a sporadic nature must be looked for, the origin and symptoms of which may be quite varied; yet, the fact must not be overlooked that they are in large measure due to insufficient hygienic precautions at time of

parturition and afterwards. Full value remains in the treatments outlined by Hess and Albrechtsen for affections of the ovaries, the vagina, the uterus and its neck.

Infertility of Male Domestic Animals

Professor Nils Lagerlöf (Sweden), in his contribution to the subject, dealt with infertility of male domestic animals, saying that infertility or sterility in them is a subject worthy of far greater attention than it has hitherto been given to it, since it is a common cause of disturbances in the reproduction of domestic animals. This holds good chiefly in cattle breeding, but in the breeding of horses, pigs, goats and sheep cases of infertility or sterility of the males also seem to become more and more common. Cases of impotentia coeundi and cases of impotentia generandi where there exist distinctly noticeable symptoms or clear pathological-anatomical changes in the sexual organs, *e.g.*, acute Brucella orchitis in bulls, have to a large extent been observed and described in the veterinary-medical literature. On the other hand, cases of degenerative atrophy of the seminal epithelium with ensuing disturbance of the spermiogenesis and reduced or arrested fertility in the male animal seem often to have been overlooked or ignored.

The commonest morbid changes in the testicles which give rise to reduced or ceased capacity of fertility, are according to the author's observations in Sweden, which have chiefly been based on the investigation into sterile bulls, as follows:

(1) Testicular hypoplasia, about 23 per cent. of the cases.

(2) Degenerative changes in the seminal epithelium, about 41 per cent. of the cases.

(3) Fibrosis testis, about 12 per cent. of the cases.

(4) Inflammatory testicular changes, about 24 per cent. of the cases.

Testicular hypoplasia is comparatively often met with in young males of some breeds when they are put to service. Testicular hypoplasia appears to be hereditary. The most common cause of disturbance in the spermiogenesis seems to be degenerative atrophy of the seminal epithelium, which occurs in various degrees and entails major or minor pathological changes of the semen picture. Advanced cases of such atrophy entail fibrosis testis and complete sterility.

Professor Lagerlöf recounted cases of experimental degenerative testicular atrophy, produced by heat insulation of the scotum, where it has been shown that the changes in the semen picture as a rule are in a direct ratio to the degree of the degenerative changes in the seminal epithelium. Tests have also shown that degeneration, where such can take place, takes as a rule as many months.

Testicular inflammation is mostly caused in bulls by *Brucella abortus*. If the testicle attacked is removed at once, there occur nevertheless degenerative changes in the non-attacked testicle, but regeneration occurs after two to three months and the bull as a rule becomes fertile.

Morbid changes in the accessory sexual glands are fairly common in bulls, where the formation of abscesses is met with in the seminal bladders, caused by infection by *Brucella abortus*, tuberculosis, pyogenesis or streptococci. Streptococcal infection in the sperm of bulls is a fairly common cause of sterility in cattle herds. Thorough, repeated semen investigations with a view to ascertaining the number of spermatozoa and their motility, also the micropathology and bacteriological investigation of the sperm are of inestimable value for making a diagnosis and prognosis in cases of sterility of domestic animals. As regards the technique employed in a thorough semen examination, the speaker referred to more recent works by Lagerlöf (bulls), McKenzie and Berliner (rams) and Rodolfo (boar).

Concerning the treatment of infertility in male animals, chief attention must be devoted to prophylactic measures.

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PERSONAL

Golden Wedding.—Mr. Thomas D. Connochie, M.R.C.V.S., and Mrs. Connochie, Braeside, Galashiels, have celebrated their golden wedding, having been married in Selkirk in August, 1888, by the late Rev. John Lawson.

Mr. Connochie has practised as a veterinary surgeon in Selkirkshire for 56 years. Born in Selkirk in 1862, he was educated at the Grammar School there, leaving at the age of 14 to work in the Union Bank in Selkirk. He entered the New Veterinary College, Edinburgh, in 1878, passing out in 1882. He commenced his career in Selkirk and in 1886, after four years' work in Ettrick and Yarrow, went to Galashiels, where he started his practice which he still continues.

"Mr. Connochie comes of a notable family of veterinary surgeons, and he can count nine relations who were engaged in the same profession as himself," says the *Edinburgh Evening Dispatch*. "In his early days he was a fine horseman and frequently won races at Selkirk Common Riding, of which he has always been a keen supporter. A very active man, Mr. Connochie, who still enjoys good health, has travelled all over the Borders in connection with his duties, and he is familiar with every farmer in the district. A keen student of human nature, he possesses a rich fund of stories and anecdotes, and for many years his services as a raconteur have been in great demand at social functions. An ardent Burns-ite, he has been prominently identified with the Clovenfords Burns Club since its institution and is a Past-President of the Club. He is also a prominent Freemason.

"In February of this year, when he was the guest at the annual dinner of Selkirk and Galashiels Agricultural Society, he was presented with a wallet of notes in appreciation of his services to agriculture in the Border district.

"Mrs. Connochie, who is also a native of Selkirk, was, prior to her marriage, Miss Agnes Murray Hope. They have had a family of two sons and two daughters, of whom one son and one daughter are alive. One son, Lieutenant Hope Connochie, K.O.S.B., was killed in Flanders during the War."

. . . . .

Family's 100 Years' Service.—At a recent meeting of the Yarmouth Town Council the Town Clerk informed the Watch Committee that in consequence of the provisions of the Agriculture Act, 1937, involving the transference to the Ministry of the duties of the Council relating to veterinary inspection, it was necessary to terminate the appointment of Mr. W. Shipley as Veterinary Inspector under the Council. The committee directed the Town Clerk to convey to Mr. Shipley the Council's appreciation of his services, and those members of his family extending over the past 100 years.

. . . . .

Will.—Littler, Mr. Justus, of Oakham, veterinary surgeon (net personalty £10,400), £22,066.

THE BRITISH ASSOCIATION

General Condition of British Agriculture

Sir Daniel Hall, F.R.S., opening discussion in the Agriculture Section of the Cambridge meeting of the British Association for the Advancement of Science, on the general condition of British agriculture, said it was agreed that our agriculture was on the decline, and that the land was suffering. Indeed it was obvious to everyone as one travelled across the country, except in a few favoured districts. Moreover, some of our best land was rapidly being taken for road making, for aerodromes, and for building and other urban purposes, and so agricultural production was being displaced.

Our grass land, which was the major factor in our agriculture, was being neglected. It was said the decline in crop production was being made up by increase in livestock, but our pigs and poultry, our milk and beef, were not the grown product of our own land; they were a manufactured product of imported foodstuffs.

The most significant of all the factors of decline was the diminution in the number of men engaged on the land, and the loss of the rising generation of the agricultural community to the public services—the Army, the Air Force, the police, and other departments. Apologists for this state of affairs pointed to remedial measures, now costing £40,000,000 a year. But these were not liked by the farmers and were not increasing our farming. These measures all aimed at maintaining the *status quo* and not at any improvements in farming; but they were not even succeeding in maintaining the *status quo*, for the progressive deterioration went on unchecked.

What were we going to do about it? Nothing, said our industrialists, who were content to see our agriculture perish and to have the farmers kept quiet and comfortable at the cost of the State, so that they might die out easily. But there was fortunately another side to the question. Many men were to be found who did not believe that farming could not be may to pay, and indeed who were themselves making money out of it and who, while grateful for bounties and subsidies, could really get on quite well without those aids. Why could we not have more such men? Why could they not expand their business, like any successful manufacturer, until their production covered the available market?

It was because the successful practitioner in farming could not obtain either the land or the capital to enable him to spread out his business on a larger scale; for him there was nothing parallel to the rapid growth which followed the invention of a new industry or the cheapening of a new process. The crux of the matter lay in the control of the land. Nobody but the owners of the land could ensure that it should be properly farmed. Financial stimulus to better farming was not inducing better farming; that could only be compelled, and it was only the landowner who could exercise the necessary sort of control.

Why had the landlords of Great Britain ceased to have much influence upon the farming of their own land? It was because they were hampered by legislation, and because any immediate return from any effort on their part was extremely problematic. It was only the State that could afford to set about the reconditioning of British agricultural land and secure its better management. It was no good supposing that at the present time the nationalisation of the land of Great Britain was a matter of practical politics, though people would be surprised, said Sir Daniel Hall, at the number of good landlords—and good Conservatives at that—who would admit, in private, that the land ought to be nationalised. "But not in our time" they would add. (Laughter.) But this did not mean that our system of land management and tenure was absolute and could not be changed. It had been changed many times in the past 500 years, and changes could be effected more rapidly nowadays.

The State and the Farm

The speaker had proposed a method: the setting up of a body charged by the State and subsidised by the State to purchase the second-class and poorer land and get it into order and farmed properly. This was necessarily a piecemeal method, but even if the State could tomorrow take over all the land, it could only begin farming it piecemeal.

Such a form of State activity was surely as necessary to-day as the production of shells and airplanes for national defence. No doubt such a policy would be greatly distrusted at the outset, but the State was always acquiring land, and in large quantities, for all kinds of purposes, particularly defence.

"I don't think it is a cheap sneer to suggest that the State, so busy in that way, should also busy itself similarly for the purposes of peace and for improving its own personal estate. If not, what is the alternative?"

. . . . .

This (the State and the farm) aspect of the subject was also touched upon by the President of the Section, Professor R. G. Stapledon, Professor of Agricultural Botany in the University College of Wales, Aberystwyth, and Director of the Welsh Plant Breeding Station. The precise subject of his address, however, was "Ley-farming and a long-term agricultural policy," and had to do, as he put it, with the most honourable, and what should be the most venerated, aspect of the whole of agriculture—the rotation. A ley in agricultural parlance is a field sown down to grass and/or clovers designed to take a definite place in a rotation, and destined to be periodically ploughed up. The ley-farmer, he said, must be a proficient stockmaster and a proficient cultivator, versed alike in the arts of animal and crop husbandry.

Agricultural thought in recent decades, he submitted, had turned ever more exclusively towards the narrow, too narrow, as he thought, path of commodities, each considered as such. Excessive concentration on commodities led inevitably towards monoculture, and to what we were too lightly pleased to call specialisation, and led away from the rotation and ultimately to disaster.

Greatly daring, he had set himself to combat this modern fetish that had revealed itself not only in the trends of agricultural science but in a very great deal of what the State had endeavoured to achieve for agriculture.

In the precarious state of the world to-day there could be only one approach to the problems of agriculture, and that was the national approach. We must not so much consider what was good for the farmer as what was good for the State; then what was good for the State must be made good for the farmer.

The success of a long-term agricultural policy must be judged in the main by the sureness and rapidity with which all the farmers of the country, in order to meet any emergency, proved themselves able to pass from the production of one series of commodities to the production of another, or radically to alter the proportions of the several commodities produced.

It appeared to him, Professor Stapledon said, that the present needs of the State, and also the more menacing of the foreseeable contingencies, united to demand one and the same essential contribution from our agriculture. It was not for him to attempt to decide whether war danger or the danger of our about-rapidly-to-dwindle population was the greater peril; little less disconcerting were the effects of soil erosion and soil depletion in those countries from which we were wont to obtain abundant and cheap supplies of food.

He was concerned with the kind of policy which would take at least ten years to put into full operation.

He believed the extent of the influences of soil erosion and depletion were not even yet fully realised. Our own rough and hill grazings had manifestly deteriorated; witness the spread of bracken. They had become increasingly depleted of lime and phosphates in recent decades, and the same thing must be happening to a greater or lesser extent—sometimes accompanied by actual erosion—in all the great ranching areas of the world.

What was demanded of our agriculture, he added, was, first, to maintain as large a rural population as possible, for probably on a large and contented rural population depended to a marked degree the increase of our population as a whole; secondly, to maintain as large an acreage as possible in a highly fertile and always ploughable condition; and thirdly, so to conduct our farming as to allow at all times, and in all places, for the absolute maximum of flexibility in commodity production.

In a review of present conditions, Professor Stapledon said that leys, so long as they continued to be managed as such, were almost invariably managed better than permanent grass.

He advocated a four-year ley, ending with at least two years of honest hard grazing. Ley-farming, he said in conclusion, afforded in his view great scope for a reorientation of such working capital as the farming community possessed, and of the monetary and other arrangements existing between landlord and tenant.

. . . . . .

Later in the meeting, also in the Agriculture Section, a discussion on practical problems of animal production brought out numerous valuable practical points. Professor Hammond pointed out the need of food storage for animals as well as for men as a war measure, and he emphasised the need of improving the environment if the best results were to be obtained from scientific breeding.

On Wednesday last, Mr. E. L. Taylor, M.V.Sc., M.R.C.V.S., D.V.H., of the Ministry's Laboratory, addressed the Section on "Parasitic Diseases of Animals."

An interesting symposium in the Chemistry Section was on the biological and medical repercussion of synthetic organic chemistry, and especially striking were the reports concerning the chemical and physiological relationships of male, female, and adrenal cortex hormones.

Professor Dodds reported the synthesis of a substance several times as potent as the natural female sex hormone, and prophesied that very much more potent substances would soon be made. Professor Cook discussed recent advances in our knowledge of cancer-producing substances.

In the Botany Section, during a discussion on plant virus research, Mr. Bawden reported that one virus had been isolated in a chemically pure state and found to consist of nucleoprotein with an enormous molecular weight. It was possible to inactivate the virus by various treatments while retaining its immunological properties; this might have important medical results in ensuring safe vaccination against human and animal virus diseases.

* * * * *

ACCLIMATISATION IN RELATION TO LIVESTOCK IMPROVEMENT

In a recent letter which appeared in the supplement to *Nature*, Professor Prawochenski of the Jagellonian University, Cracow, suggests that the capacity for breeds of animals exported from one country to another, to become acclimatised to their new environment, is to some extent correlated to genetic constitution.

He points out that certain breeds quickly adapt themselves to environmental conditions vastly different from those in the country of their origin, while other breeds fail to do so.

He states that the genetic constitution of modern breeds of animals has so changed during the last 100 years, that many depend for their survival upon human assistance, and have to a large extent lost the capacity to live under natural conditions. He thinks that when this happens in a country it may be advisable to import foreign breeds which are better adapted than the local breeds which may have been weakened by constant selection upon false standards for many generations.

An example is given in illustration. In the Zoological Gardens at Warsaw the European red deer (*Cervus Elephas*) from local forests, are "very susceptible to colds, and usually succumb to pneumonia," when kept in open paddocks during winter. On the other hand, the spotted wild deer imported from India, running in similar paddocks and managed similarly, remain in good condition and robust health. Professor Prawochenski states that others confirm this observation, which appears to hold good for other mammals imported to Warsaw from the tropics.

We quote the last two paragraphs of the communication, as follows:—

> "Accordingly, one is forced to the conclusion that the genotype of the European deer has been weakened. These wild deer of Europe are kept under abnormal conditions. Not only is natural selection removed, but also, since the sportsmen shoot the best males, it is the least thrifty specimens that produce the next generation. These wild deer have to be artificially fed during the winter.
>
> "Accordingly, consideration of the problem of acclimatisation of domesticated animals in European conditions must include the weakened condition of domesticated strains. It appears to me that this emphasises the need for skilful selection on the part of the breeder of these domesticated strains, and that this is a more important factor in economical production than suitable environmental conditions. But, of course, the progressive breeder will make his choice of the right breed in its right environment."

[We feel that, while there is undoubtedly some truth in what Professor Prawochenski says, the premises upon which he bases his conclusions are somewhat slender. It is, for instance, not good genetics or scientific argument to draw a parallel between the reactions of the European wild red deer and the Indian spotted deer, when both are kept under the same environment in Warsaw. Under natural conditions both species are subject to the same kind of natural and artificial selection, and it would be extremely difficult to prove that the reason for the better reactions of the Indian species to the environment of the Warsaw Zoological Gardens, had anything whatever to do with its genetic constitution. A much more likely cause of the differences is that the causal organism of the respiratory condition described, has a different degree of pathogenicity for each species.

Further, there is now a massive body of evidence available to show how most breeds of domesticated livestock react to their new environment when exported abroad. The preeminence of stock of British origin in numerous overseas countries—Argentine, Canada, Australia, New Zealand, South Africa, etc., and a marked improvement which results when British bred stock is used for cross breeding (or even for founding entirely new breeds), such as has occurred in America, Germany, Denmark, India, etc., seems to go a long way towards showing that a sufficient degree of skill has been exercised by British breeders at least.]

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ARMY VETERINARY SERVICE

The following officers are at present in this country on leave *ex*-India: Major H. Jerrom, Captain J. McL. Ross, Major P. F. Woodland, Lieut.-Colonel R. A. Gooderidge, O.B.E., and Major H. Stephenson, M.C., the last named on sick leave.

Major J. Southall is also at home on leave *ex*-Burma.

* * * * *

THE PREVENTION OR ARREST OF LACTATION

In the issue of the *Deutsche medizinische Wochenschrift* for May 27th, 1938, Ramos and Colombo of Buenos Aires state that lactation can with safety and certainty be artificially terminated by the use of oestrin. During the past two years they have used oestrin for this purpose in 50 cases in which arrest of lactation was necessary. They argue that after mammary enlargement has taken place during pregnancy, actual milk secretion is prevented by the presence of oestrin circulating in the blood: then after parturition, oestrin rapidly disappears during the first two to three days and milk is secreted.

In the human being, the mode of administration was to give oestradiol benzoate in oil in 10,000 unit doses intramuscularly every twelve hours for three or four doses, when death of a child or some condition of the mother made it imperative that she should not lactate. If the injections are commenced immediately after delivery no further treatment is necessary. If delayed, however, removal of any accumulated milk may be required after the second injection. No congestion, pain or discomfort is experienced.

A noteworthy feature is that after injections are stopped, milk secretion does not recommence until a subsequent pregnancy. Ramos and Colombo ascribe this to the dosage of oestrin used being far larger than the amount normally in the circulation at the end of pregnancy. They also consider that the oily solution employed results in a maintenance of action for a much longer period of time, so that the normal retrogressive changes of the secretory cells are well established before the inhibiting action of the oestrin passes off.

A warning is given that oestrin used for the induction of labour, may, in the human being, gravely prejudice lactation during the first week of post-parturition.

[While this communication refers specifically to the human being, it would be well to bear in mind its implications when considering the use of any oestrone preparation for lactating cows. The use of oestrone as a method of inducing labour in cases of bovine dystocia is hardly likely to arise for some time to come because of its high cost, but there may be some who are tempted to use it in bitches. The possibility that lactation may be arrested even temporarily should not be lost sight of when arriving at a decision.]

* * * * *

THE BORDERLAND OF LIFE

"Four years ago most workers on viruses when questioned as to the probable nature of the filtrable agents they were studying would have replied with little hesitation that they were minute living micro-organisms," states the *Lancet* (June 11th), and continues: "To-day this question would not perhaps be answered so confidently, though workers in this country at any rate still largely subscribe to the 'living' theory. Their faith in it, however, has been a little shaken by the recent demonstration that certain plant viruses, more particularly the virus of tobacco mosaic and its variants, are peculiar proteins of very high molecular weight. Though before 1935 various investigators held that tobacco mosaic virus was probably a simple protein, it was W. M. Stanley in America who in that year provided the first really solid evidence in support of this contention. And although the observations made at Cambridge by Bawden, Pirie, Bernal, and Fankuchen are in disagreement with Stanley's findings on one point—the possibility of obtaining the tobacco mosaic virus in the form of true crystals—in all other respects they are in full accord; tobacco mosaic virus seems to be a heavy protein of very large molecular size which can be obtained in a high state of purity without any loss of virulence. Both in America and this country rapid strides have been made in this aspect of plant virus research. The variants to which tobacco mosaic virus gives rise, as well as several other plant viruses, have been identified with heavy proteins, each virus protein being clearly distinguishable from the rest; the protein of one virus, that of bushy stunt, has been obtained by the Cambridge workers in the form of true crystals. Although there is still just a possibility that these proteins are not the viruses themselves, but an impurity in the form of pathological proteins resulting from the disease process with which the virus is associated, the available evidence strongly supports the view that the proteins are in fact the viruses. Some viruses, then, seem to be nucleo-proteins that can be obtained in paracrystalline or crystalline form and, according to accepted view as to what

constitutes life, are non-living agents. And it is the bearing of this astounding new knowledge on the problem of the nature of viruses in general that is engaging the attention of virus workers throughout the world to-day.

"Are we to abandon the idea that any of the viruses, even the largest animal ones, are living organised things and conclude that all viruses are non-living? Or must we assume that the big group of disease agents which we call viruses is really a heterogeneous collection comprising both living and non-living agents? There is a third possibility—to make more liberal our views on what constitutes life and to admit that as the result of adaptation to a parasitic existence a micro-organism may eventually lose all enzyme activity and become completely dependent on the cells it parasitises for all the factors necessary for its existence—a form of life without an independent metabolism. It is this conception which Sir Patrick Laidlaw puts forward in the Rede lecture for 1938 which he delivered recently at Cambridge.* He accepts the large viruses as minute bacteria. They have definite shape and size; they can reproduce themselves and retain their individuality irrespective of the cellular environment in which this multiplication takes place; and some of them have an antigenic complexity similar to that of bacteria. The only thing which they have not been shown to possess is an independent metabolism and it is not, as Sir Patrick points out, their size which would prevent this, since the organism of bovine pleuro-pneumonia and the minute organsms which he and W. J. Elford isolated from sewage are of the same order of size as the large viruses and yet have demonstrable metabolic activities. Sir Patrick is not prepared to accept the view put forward by Stanley and others that those plant viruses which are simple proteins are autocatalysts. His objection is that this hypothesis presupposes the existence of a precursor substance in the susceptible cells from which the autocatalytic virus manufactures itself. A virus with a wide host range would require the presence of the specific precursor in the cells of quite unrelated species. The cells of the chorio-allantoic membrane of the developing hen's egg, susceptible to many viruses, would have to possess a whole range of precursor substances, which is hardly credible. Another objection to the autocatalytic hypothesis is that if the formation of a virus from its precursor were such a simple matter one would expect viruses to arise spontaneously in isolated communities from time to time and there is no evidence that this occurs. Further, if one accepts the large viruses like vaccinia and psittacosis as living micro-organisms and the plant virus proteins and possibly the very small animal viruses as non-living autocatalysts, where, Sir Patrick asks, is one to draw the line? If, for instance, the virus of foot-and-mouth disease is to be placed in the non-living group, where is one to classify the virus of vesicular stomatitis which, though considerably larger, produces an identical clinical condition?

"As Sir Henry Dale concluded in his Huxley lecture three years ago, the virus group has to be considered as a whole. Either viruses are all living things or they are all non-living agents; to draw a line dividing the group into two classes of agent of such diverse character appears almost impossible. Finding himself in agreement with this conclusion, Sir Patrick Laidlaw puts forward the view that in the group of viruses we have a collection of micro-organisms which have traversed the path of evolution towards the goal of complete parasitism to varying degrees. The large viruses would thus be those which had lost the power to synthesise one or two essential factors necessary for their life and had so become dependent on that cellular environment where these particular factors were to be found. And passing down the virus scale there would be the loss of more and more metabolic activities until one reached the smallest viruses bereft of all ferment activity, the "ultra-parasites" resigned to living a borrowed life. The very simplest form of virus would thus be micro-organisms which had lost everything except the ability to transmit the character of the species. It is, assuredly, a most attractive hypothesis but it leaves one point unexplained. If the very simplest form of virus which is represented by a simple nucleo-protein in molecular dispersion does not reproduce itself by autocatalysis, then how does it multiply? Does it do this by fission? If so, this is something quite foreign to our conception of the behaviour of molecules."

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EFFECT OF TOTAL SYMPATHECTOMY ON REACTION TO HAEMORRHAGE

"Freeman and those working with him on problems of circulation in animals draw a distinction between two aspects of the reaction of the body to haemorrhage,"[1] says a recent *Lancet* annotation. "The symptoms produced, as they have convincingly shown by their experiments on dogs, are due in part to the diminution of blood volume, and in part to the vasoconstriction which is the normal response of the circulatory system to severe haemorrhage. The vasoconstriction must be regarded as life-saving inasmuch as it maintains the circulation to the heart and brain, these vital organs not being to any great extent affected by reflex vasoconstriction. But the mechanism that protects the vital organs results in a definite decrease of the circulation in the peripheral tissues which, if long continued, is associated with the signs and symptoms typical of traumatic shock, including acidosis and concentration of the blood.

"Sympathectomy alters the picture. A totally sympathectomised dog was unable to tolerate such large haemorrhages as was the normal animal, because in the absence of peripheral vasoconstriction there was no vascular mechanism for retaining an adequate circulation to the heart and brain. On the other hand when a low level of blood pressure was produced by haemorrhage the peripheral circulation was certainly more efficient in the sympathectomised than in the normal dogs, and the good response to blood transfusion was immediate. In other words the condition of shock as manifested by a negative response to blood transfusion did not develop. In the normal animal this condition was produced by repeated haemorrhages so that the blood pressure was maintained for more than six hours below Cannon's 'critical level' of 70 mm. Hg. Even restoring to the animal so treated all the blood which had been withdrawn did not save it from ultimate circulatory collapse and death. The blood pressure was recorded by means of a

*Virus Disease and Viruses. By Sir Patrick Laidlaw, F.R.C.P., F.R.S. London: Cambridge University Press. 1938. Pp. 52. 2s. 6d.

[1]Freeman, N. E., Shaffer, S. A., Schecter, A. E., and Holling, H. E., *Jl. cin. Invest.* May 1938, p. 359.

cannula in the carotid artery, through which the animal could be bled. An index of the peripheral blood flow was obtained by determining by means of a plethysmograph the blood flow through the hind paw. The dogs were trained so that only a local anaesthetic for the insertion of the arterial cannula was required. The charts showing the contrast between the effect of haemorrhage and transfusion in the normal and sympathectomised dogs are most striking. Whereas in the totally sympathectomised dog blood-pressure and peripheral blood-flow readings ran parallel, in the normal animal blood-pressure readings tended after the initial fall to maintain a moderately high level, while the peripheral blood flow fell suddenly to a low level and thereafter gradually declined. Even when the condition of shock was fully developed there was no evidence of fatigue of the peripheral vasoconstrictor mechanism. The readings following a transfusion given after the blood pressure of the animals had been below the critical level for five to seven hours showed remarkable differences. In the sympathectomised animal a rapid rise to pre-haemorrhage levels occurred; in the normal animal a slight transitory rise in the blood flow curve was the only effect, and the animal died despite the administration of more blood than had been withdrawn.

"Since Freeman found evidence of cerebral damage—stupor and extensor rigidity—when some of the sympathectomised dogs recovered from the effects of haemorrhage, he does not suggest paralysis of the sympathetic system as a method of preventing shock. Attempts to effect this by means of ergot derivatives or spinal anaesthesia would be dangerous, for their success would remove the mechanism which protects the vital centres. Certain lessons of value in clinical practice may, however, be deduced from these experiments. Apparently blood transfusion for haemorrhage, to be effective, must be done before vasoconstriction has reduced the peripheral blood flow for too long a period. It should moreover be carried out slowly, for in dogs too rapid injection of blood occasionally resulted in circulatory failure with dilatation of the right heart; in such cases the withdrawal and reinjection of the blood sometimes saves the animal. Freeman had previously shown[2] that continuous administration of adrenaline, or hyperactivity of the sympathetic nervous system, can itself cause a condition of shock, and these new experiments support the contention that vasoconstrictor drugs have no place in the treatment of shock secondary to haemorrhage. At the best they supplement the normal process of vasoconstriction, which, however, shows no signs of failure during shock. The use of vasoconstrictors momentarily improves the blood-supply to the brain and heart, but at the same time reduces the peripheral blood flow and promotes the development of shock. Another point of interest is that sections of the liver and duodenum from animals dying of shock showed not only that both organs were engorged with blood, but also that necrosis of the liver cells had occurred. Similar findings[3] in patients dying from extensive burns have been attributed to toxaemia. It is unlikely that toxaemia could have accounted for them in these dogs, except as a result of tissue damage secondary to the inadequate peripheral blood flow of shock. Another interesting observation is that in two normal dogs which recovered, although the blood pressure had been reduced to between 60 and 80 mm. Hg for a long period, the peripheral circulation was exceptionally well maintained, and that the phlegmatic disposition of these two animals was particularly noticed. It is perhaps unnecessary to emphasise what is known to every clinician—that the mental attitude of patients at a time of severe crisis, such as a haemorrhage, may be a definite factor in their response to treatment."

[2]Freeman, N. E., *Amer. J. Physiol.* 1933, **103**, 185.

[3]Wilson, W. C., MacGregor, A. R., and Stewart, C. P., *Brit. J. Surg* April, 1938, p. 826.

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Foot-and-Mouth Disease in Wales

The existence of foot-and-mouth disease was confirmed on Sunday last among cattle at Glanconway, Denbigh. The area subject to restrictions in the movement of animals lies in the counties of Anglesey, Caernarvon, Denbigh, and Flint.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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GRASS-SICKNESS MAY BE MATRICARINOSIS EQUORUM*

To the Editor of the Veterinary Record

Sir,—Whilst on holiday in Dundee from South Africa, I happened to notice a paragraph in a local paper, dealing with grass-sickness in horses. As I had not seen a case of the disease I called on Major Andrew Spreull, whose brother was in the same service as myself in South Africa, and he and his son, Dr. J. Spreull, very kindly motored me to several farms where I saw cases of grass sickness. I happened to notice on all these farms a plant growing in considerable quantities which appeared to be of the same order as one growing in parts of Natal where it is responsible for a very fatal disease amongst cattle. Major Spreull had a specimen of the plant sent to Dr. R. Stewart McDougal for identification, and sure enough it proved to belong to the same family as the South African variety—the name of the South African plant is *Matricaria nigelaefolia* and that of the one in Scotland, *Matricaria suaveolens.*

Some of the symptoms and *post-mortem* appearances due to ingestion of this plant by cattle in South Africa are similar to those found in grass-sickness, *viz.*, quivering of the superficial muscles, difficulty in swallowing and impaction and fatty degeneration of the liver. When I drew the attention of Major Spreull to this plant and suggested it might be the cause of grass-sickness, he at once became interested and decided to carry out a feeding test, and is now trying to obtain suitable horses to feed with the plant. Unfortunately it is rather late

* Our correspondent's heading.

in the season, the plant now being fully grown and fibrous and in the seeding stage, but even so horses will readily eat the plant. Whether it is poisonous at this stage or only in its young succulent stage can only be discovered by experiment. I might mention that this plant grows luxuriantly around the farm buildings, inside pastures around the gates where the ground has been denuded of grass, along old wagon tracks, etc., and is about the most obvious weed to be found and probably for that reason has never excited suspicion. I understand that this weed was originally imported from North America and has spread in this country, as in Natal, firstly along the land adjoining rivers and streams.

Undoubtedly *Matricaria* will be found on farms and parts of the country where grass-sickness is unknown but even that does not preclude *Matricaria* as a cause of the disease. In Natal cattle may graze over veldt covered with these plants for years and not touch them, yet a season will come along when for some unknown reason cattle will eat the plants and die by the score. There seems to be some contributory cause which induces cattle to eat the plant: possibly some deficiency in the grasses, which the animals try to rectify by eating the aromatic *Matricaria*.

I have noticed that since farmers in Natal have taken to giving cattle bone meal regularly in order to overcome the phosphate deficiency which causes "stiff-sickness" and indirectly "lam-ziekte" little has been heard of *Matricaria* poisoning, so perhaps by overcoming the phosphate deficiency the craving for *Matricaria* has ceased and it may be the same with grass-sickness, namely, that it is only horses on certain farms which develop a craving for the plant owing to some deficiency in the grasses.

I am,
Yours faithfully,
J. L. Webb, F.R.C.V.S.,
Govt. Vety. Surgeon (retired),
Union of South Africa.

Dundee.
August 10th, 1938.

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FOWL PARALYSIS

To the Editor of the Veterinary Record

Sir,—It appears to me that there will always be differences of opinion as to the causes of the above malady if one only designates all cases exhibiting paralytic symptoms in fowls as neurolymphomatosis gallinarum.

Heelsbergen of the University of Utrecht in his excellent book "Handbuch der Geflügelkrankheiten und der Geflügelzucht" wisely gives three possible causes of paralysis in fowls: (1) Worms; (2) Coccidiosis of the duodenum; (3) An unknown (filterable) virus.

With regard to the last mentioned he goes on to state:—

"(1) Fowl paralysis (*N. gallinarum*) is a disease which exhibits a characteristic clinical and pathologic-anatomic picture.

(2) The malady occurs in all parts of the United States of North America, in Holland, Australia and probably also in South America.

(3) In some regions the disease is endemic and prevails for years, cocks and hens being attacked.

(4) The malady attacks birds from three to eighteen months old. Before or after this period one notices no typical cases of the disease.

(5) The chief symptoms are: (*a*) Partial asymmetrical and progressive paralysis of the wings and both limbs and isolated neck muscles; (*b*) Occasionally or incidentally greyish tingeing of the iris and blindness. The appetite is usually retained.

(6) The course is varied; prognosis is usually bad: occasionally spontaneous recovery occurs.

(7) The chief pathological changes occur in the nervous system. In the peripheral nerves the chief characteristic is a considerable infiltration with lymphoid and plasma cells and great mononuclear leucocytes. It is accompanied by a myelinic degeneration of the medullary substance of the nerves in the more advanced changes; the cellular infiltrations apparently advance the degenerative changes. In the brain and spinal marrow there are similar preponderating infiltrations. Infiltrations of the iris by lymphoid and plasma cells occur in some cases with marked discoloration of the iris.

(8) Infiltrations of the spinal marrow and brain of isolated peripheral nerves are frequently present in hens which exhibit no clinical symptoms. One considers these are mild cases of the same disease.

(9) Micro-organisms are not proved either in the tissues or by cultural methods.

(10) *Between paralysis and infection with coccidia or intestinal worms no relation has been established.*"

Yours sincerely,
G. Mayall, M.R.C.V.S.

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A FOOT-AND-MOUTH DISEASE "PARABLE"

To the Editor of the Veterinary Record

Sir,—May I, for one, be permitted through the medium of your correspondence column to tender my thanks to Mr. Esmond Brown for his delightful and exceedingly instructive paper on foot-and-mouth disease presented to the Mid-West Division, N.V.M.A., at Bath, and published in the current issue of the *Veterinary Record*—a parable causing profound reflection in respect of each utterance and perhaps best described in the lines of Rudyard Kipling

"And told the tale of the Gauri Flood,
With circumstance and much embroidery."

Yours sincerely,
H. A. Idenden,
Captain.

9, St. Matthew's Drive,
St. Leonards-on-Sea.
August 20th, 1938.

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METHODS OF TUBERCULIN TESTING: A CORRECTION

To the Editor of the Veterinary Record

Sir,—I write to correct a regrettable error which I made in the letter on "Methods of Tuberculin Testing," appearing in your issue of July 16th. In the third paragraph, column 1, page 936: "Whether . . . it would not be logical to examine the site of the second injection at the eighty-fourth hour?" *for* "eighty-fourth" please *read* "ninety-sixth." I had no intention of suggesting that the site should be examined at the eighty-fourth hour, which as a rule occurs between dusk and daylight.

Yours faithfully,
H. C. Watson.

Hong Kong.